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Number 4.

OCTOBER, 1899.

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Including Directory.
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TEXTILE WORLD,

and
Industrial
Record.

SPECIAL WOOLEN NUMBER.

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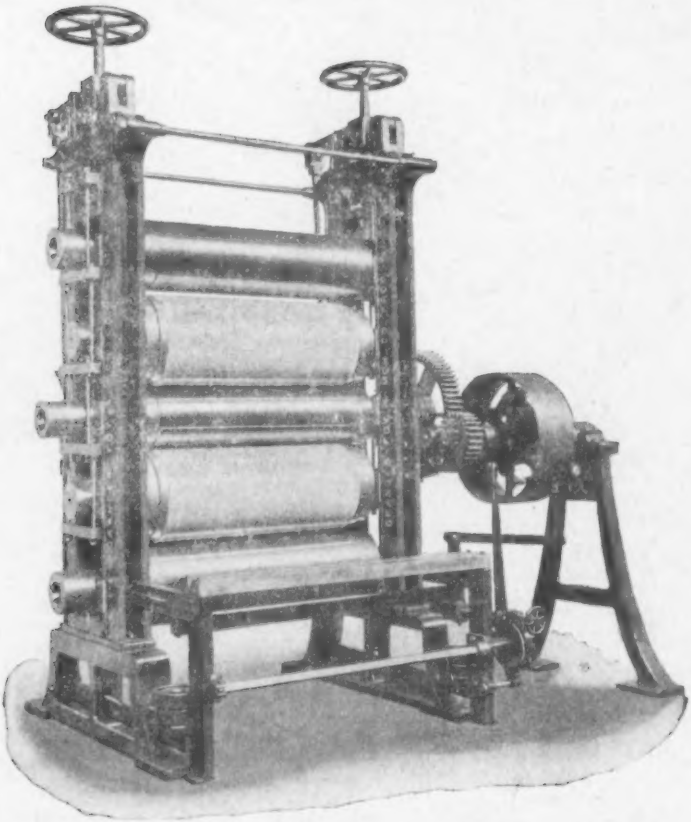
GUILD & LORD,
PUBLISHERS.

620 ATLANTIC AVENUE,
BOSTON, MASS.

Bleaching, Dyeing, Drying,

And Finishing Machinery.



CALENDARS, MANGLES AND ROLLS.

TENTERING MACHINES,
MERCERIZING MACHINES.

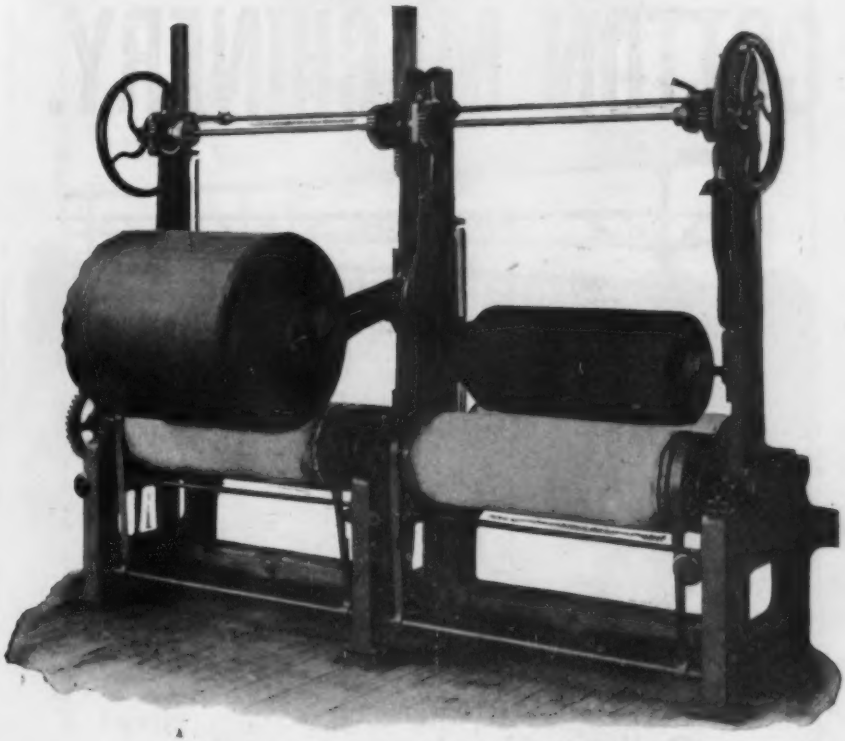
Granger Foundry and Machine Co.

PROVIDENCE, R. I.

BLEACHING, PRINTING, DYEING AND FINISHING

MACHINERY,

For Textile Fabrics



PATENT WINDING MACHINE.

W. P. SIMPSON, Patentee.

FOR USE IN CONNECTION WITH

Singeing Machines, Soaping Machines, Drying Machines, Etc.

No stoppage or even "Slacking up" of the machine is necessary.

Cutting is done close to the seam, thus eliminating waste.

As creased ends are avoided at beginning and end of roll, no refinishing is necessary.

One man can attend two or more Winders, as the new roll is started automatically, and completed roll can be removed at convenience.

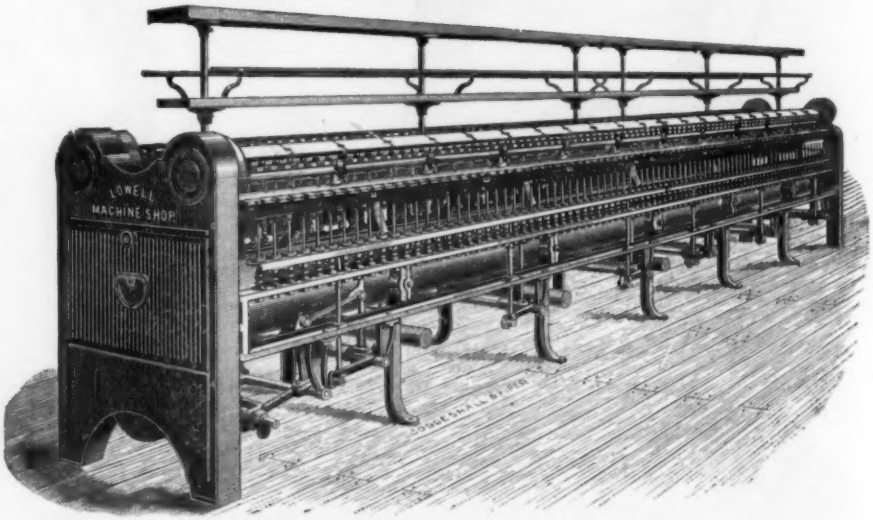
H. W. BUTTERWORTH & SONS CO.

PHILADELPHIA, PA.

LOWELL MACHINE SHOP,

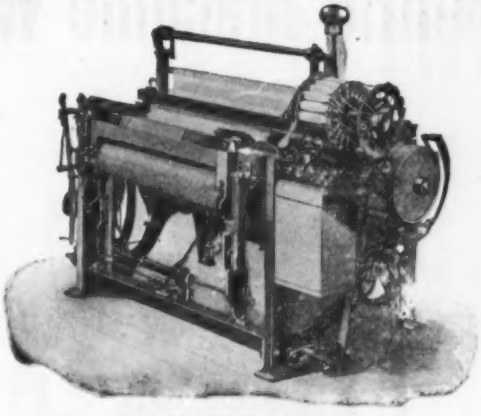
Lowell, Mass.,

COTTON MACHINERY.



Revolving Flat Cards,
Railway Heads,
Drawing Frames,
Roving Frames,
Ring Spinning Frames,
Twisters, Spoolers,
Warpers, Slashers,
Looms.

WORSTED MACHINERY.



NORTHROP LOOM.

Business is Improving.

MANY cotton mill managers will, therefore, conclude that they can possibly have a chance to run their old machinery at a profit instead of facing a daily loss.

SHOULD they fail to meet the increased demand by improving their facilities with **new machinery**, they will soon realize that the chance of a profit will bring the competition of **new mills** that will start with the latest and best equipment.

THERE is only one profitable plan—**Buy Northrop Looms.** With them the future is assured. They are no experiment. Thousands have been running for years. Sales steadily increase. The mills that refuse their opportunities will find their future utility serving as picturesque ruins in the landscape. We believe we have some honor as prophets **in our OWN country**.

WE still sell Spindles, Temples, Separators, Spinning Rings, Twisters, Warpers, Spoolers, etc., etc., etc.

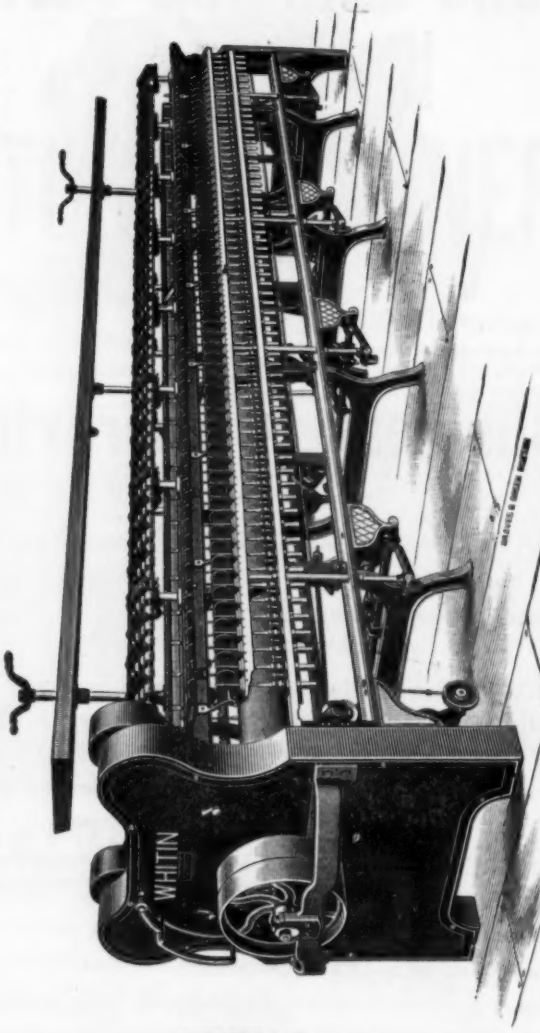
THE DRAPER COMPANY,

HOPEDALE, MASS.

The Whitin Machine Works,

Railway Heads,
Drawing Frames,
Reels,
Spoolers.

Revolving Flat Carding Engines,
Long Chain Quilling Machines,
Wet and Dry Twisters,
Looms,



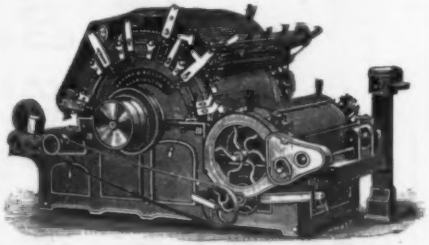
The New Whitin Ring Spinning Frame.

BUILDERS OF

COTTON MACHINERY,

Whitinsville, Mass.

Southern Office: 38 So. Tryon St., Charlotte, N. C.
S. W. CRAMER, Southern Agent.



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American Machine Company,

LIMITED,

PAWTUCKET, - R. I.

Revolving Flat Cards.

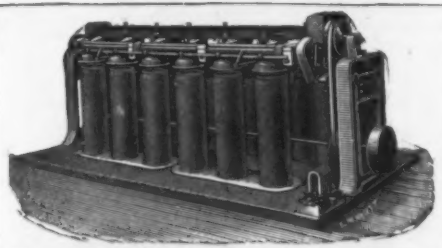
The Simplest and Most Accurate. Greatest Production. Best Quality. Least Waste.

OVER 16000 WORKING.

Electric Stop-Motion Drawing.

The quality of the sliver produced cannot be surpassed. Waste, "single" and roller laps are prevented, production increased, and great saving effected.

OVER 56,000 IN OPERATION.



Bale Breakers, Feeders,

Combined Self-Feeding Openers,

Breaker and Finisher Lappers,

All made from entirely new patterns and containing many valuable patented improvements.

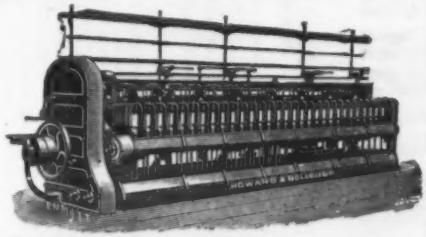
Slubbing, Intermediate, and Roving Machines.

New patented Differential motion, New Arrangement of Cone Drums, New System of Balancing top or bobbin rail, etc.

SPINNING FRAMES, CONE WINDERS,
TWISTERS, WARPERS AND SLASHERS.

All parts of above machines are made by special tools and are exact duplicates.

We Invite Investigation and Comparison.



THE FISHER CARD FEED

for WOOL, SHODDY, and COTTON, is

Second to None

on the market. It holds more stock, requires less space, and needs no "attachments."

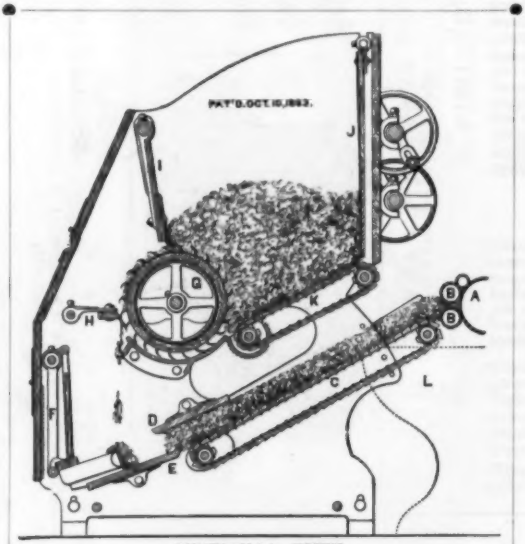
WOONSOCKET WORSTED MILLS,
Spinners of Worsted Yarns. Mixes and Fast Colors Specialties.
Boston Office, 570 Atlantic Avenue.

WOONSOCKET, R. I., March 4, 1896.

Messrs. Woonsocket Machine and Press Co., City,

GENTLEMEN—In answer to your inquiry of to day as to how we like the FISHER FEEDS would say that, after running one for three months and having put in four more since, is sufficient evidence that we consider the Fisher Feeds the best in the market to-day, and you are at liberty to bring any interested person into our mill to see them running and judge for themselves. Yours truly,

WOONSOCKET WORSTED MILLS,
EDWIN FARNELL, Agent.



SECTIONAL VIEW.

THE FISHER CARD FEED is simple in construction, is strongly built, turns out even work, requires little changing, and feeds the same whether full or nearly empty.

It is built in all sizes and guaranteed as represented.

STAR WORSTED COMPANY,
Worsted Yarns.
C. T. Crocker, Pres. C. B. Smith, Treas.

FITCHBURG, MASS., March 4, 1896.

Woonsocket Machine and Press Co.,

GENTLEMEN—We have the pleasure to inform you that the two FISHER CARD FEEDS are working to our entire satisfaction, giving good results on both long and short wools.

Yours respectfully, STAR WORSTED COMPANY,
(Second order.) A. GARTH, Supt.

MANUFACTURED BY

Woonsocket Machine and Press Co.,

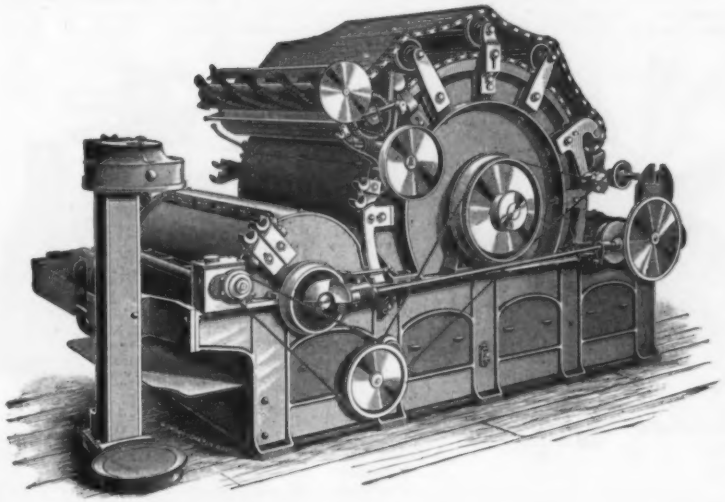
WOONSOCKET, R. I.

MASON MACHINE WORKS,

TAUNTON, MASS.

COTTON MACHINERY

REVOLVING FLAT CARD.



Cards, Combers, Railway Heads, Drawing Frames, Spinning Frames, Mules and Looms,

INCLUDING THE

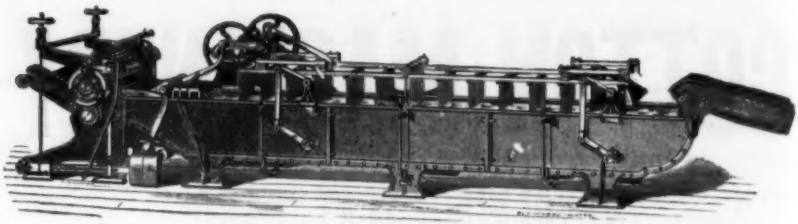
Mason-Northrop Loom.

SOUTHERN AGENCY:

D. A. TOMPKINS CO., Charlotte, N. C.

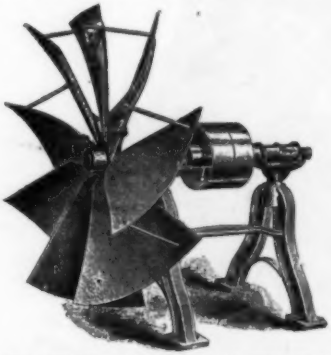
WOOL WASHING,

Preparing and Drying Machinery.

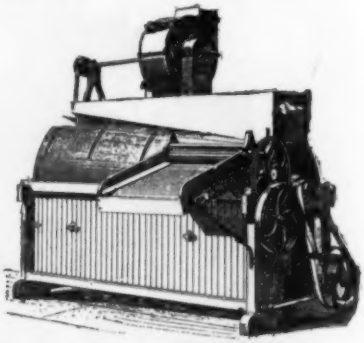


NEW PARALLEL RAKE WOOL WASHER.

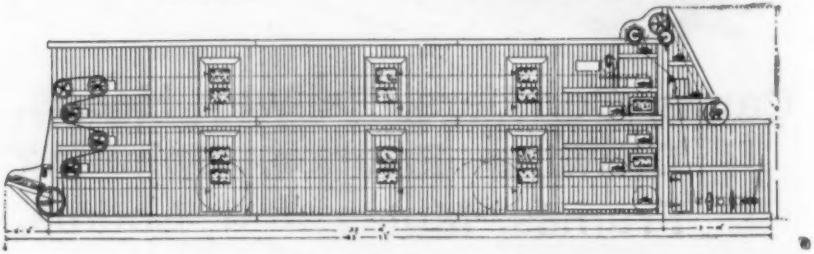
In addition to the above, we are the only builders of **Four Rake and Hydraulic Washers.** We guarantee our machines to be the **Lightest Running** and to require the **Least Repair** of any on the market. **Production and results are second to none.**



$33.00. Best and lowest priced Blower or Suction Fan on the market.



IMPROVED CONE DUSTER.
Exterior View Right-Hand Machine with Fan.



FIVE APRON WOOL DRYER.

We also Manufacture Multiple and Single Apron Dryers, Burr Pickers, Mixing Pickers, Crabbers, Self-feeders for Cotton and Wool; Breasts and Burr Machines for Cards. Wire Cylinders of all kinds repaired and Lickers in for Cotton Cards a specialty.

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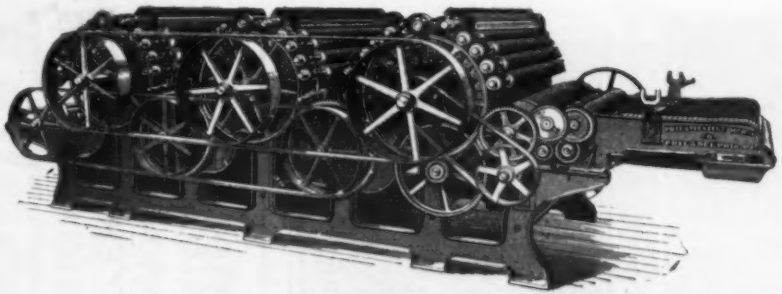


Proctor Improved Double Fancy Garnett Machine.

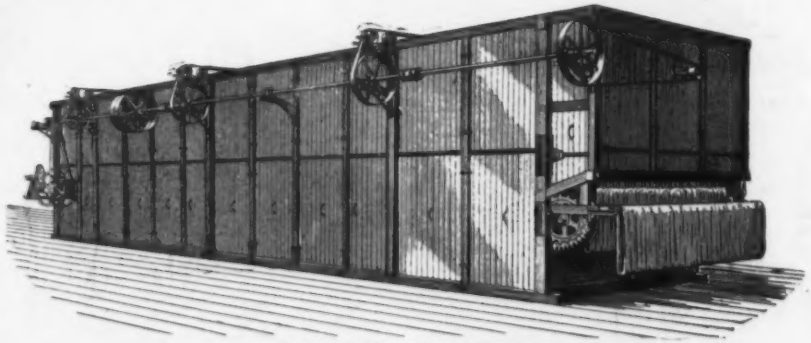
PROCTOR
GARNETT MACHINES

BREASTS, BURRING MACHINES, FEED ROLLS, LICKERS-IN.

"CYCLONE" DRYERS

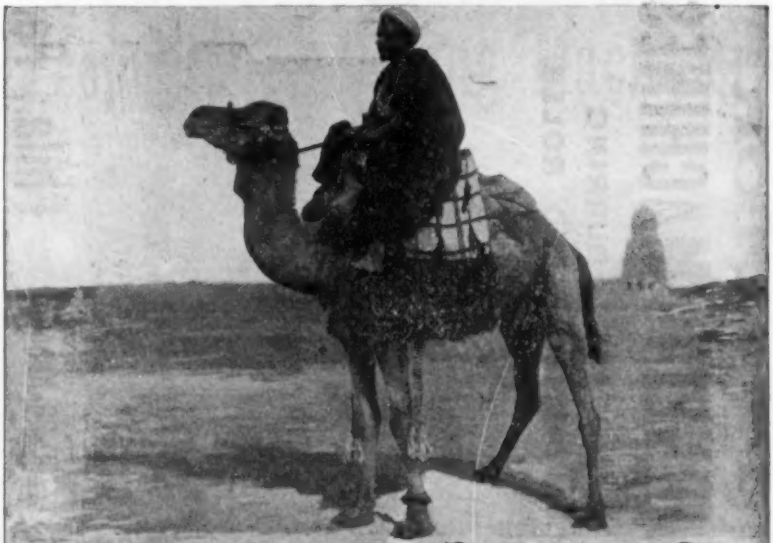
For Hosiery, Underwear, Yarn, Cotton Stock and Wool.

Carbonizing Machines.
Yarn Scourers.



Automatic Yarn Dryer.

PHILADELPHIA TEXTILE MACHINERY CO., 2750-60 Hancock St., Phila., Pa.



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FAIRMOUNT MACHINE CO
22ND & WOOD STS.
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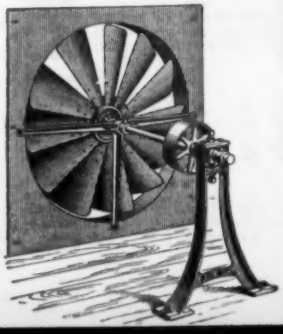
THE LATEST AND BEST
LOOMS, DOBBIES, HARNESS MOTIONS
BEAMING, SPOOLING, WINDING, DYEING AND SIZING MACHINERY.
POWER TRANSMITTING MACHINERY.
FREIGHT ELEVATORS, PATENT FRICTION CLUTCHES.



Hurricane Dryers
For Cotton Stock, Wool, Yarn, Etc.
CARBONIZERS,
HURRICANE FANS
BEST in Construction, LOWEST in Price.
Phila. Drying Machinery Co.,
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TRUCKS and BOXES.

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GEO. C. HOWARD, 1788 Barker St., Phila., Pa.

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TRAVELERS

MORLEY BUTTON M'F'G CO.,
205 Congress Street,
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ESTABLISHED 1873.
WHITINSVILLE, MASS. U.S.A.
OUR PATENTED SPECIALTIES.
DOUBLE RIBBED RINGS U.S. STANDARD. TRAVELER CLEARERS. METALIC BURNISH LIKE THAT PRODUCED BY THE TRAVELER.

"GLUGLOSS-GELATINE"

Pronounced by experts the best and purest sizing on the market for all grades of fabrics for **Finishing, Printing, Stamping,** transparent **Glazing, Filling,** and **Yarn Sizing** purposes. Adopted by a number of leading plants. "Glugloss Gelatine" is a pure, dry, granular and colorless product, readily dissolved and remains odorless. Goes much further, producing superior results at a considerably less cost than Egg Albumen, Gelatines, Gilding, Sizes, Glues, etc. Features of this product are the water-proofing or repellent finish developed, overcoming all stickness otherwise occurring, flows readily, holds color or clay in suspension, penetrates the fibre and pin holes, makes goods pliable with a soft leathery feel; no cutting or gumming of harness We solicit a trial.

Sample Furnished Gratis.

QUAKER CITY CHEMICAL CO., Sole Manufacturers and Proprietors. Wayne Junc., PHILA.

SAVOGRAN | CLEANS WOOL, FLOORS ANYTHING.
INDIA ALKALI WORKS, Boston.

KILBURN, LINCOLN & CO.,

FALL RIVER, MASS.

MAKERS OF LOOMS FOR COTTON AND SILK WEAVING.

The new Arkwright Mill in Fall River is fitted out with 1100 of our **Heavy Pattern Looms**, especially adapted to run at high speed.

We are now building our **New High Speed Loom** with the **Northrop** continuous filling and warp-stop motions attached.

We Build Looms for Weaving all Grades of Goods.

EVAN ARTHUR LEIGH,

Successor to E. A. Leigh & Company,

35 & 36 MASON BUILDING, - - BOSTON, MASS.

Sole Agent in the United States and Canada for PLATT BROTHERS & COMPANY, Ltd., by far the largest makers in the world of

Cotton, Woolen and Worsted Machinery
For All Classes of Work.

MATHER & PLATT'S Dyeing and Finishing Machinery.
JOSEPH SYKES BROS.' Card Clothing.
LOOMS of all descriptions, etc.

ELLIOT CLOTH FOLDER AND MEASURER

For Cotton and Gingham Mills, Bleacheries, Print Works, Etc.

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ELLIOT & HALL,

54 1-2 Hermon St., Worcester, Mass. Send for Circular

ESTABLISHED 1865.

W. W. ALTEMUS & SON,

Patent Bobbin and Cop Winders, Spoolers, Beamers, Warp Mills, Chenille Cutting, Carpet Rolling Machines, Reels, Etc.

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SPINDLES

Also FLYERS, STEEL CAPS, BOLSTERS, STEPS, TUBES, Etc.

For Cotton, Woolen, Worsted, Silk, and Flax Machinery.

MANUFACTURERS AND REPAIRERS

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Formerly with Bridesburg Mfg. Co.

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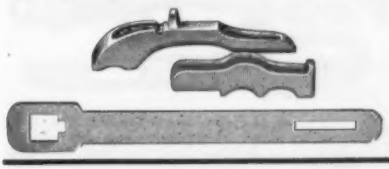
HEDDLE FRAMES.
WIRE HEDDLES.
TEMPERED STEEL WIRE STRIPPER CARDS.

ADDRESS L. S. WATSON MFG. CO., LEICESTER, MASS., FOR THE VERY BEST MADE

DIXON LUBRICATING SADDLE CO., BRISTOL, R. I.

Sole Manufacturers of

Dixon's Patent Locking Saddles and Stirrups.



The weight can be taken off and put on to the middle rolls, without stopping your frames, when long staple cotton is used.

The Stirrup is always in place.

No bent stirrup resting on rolls.

Manufacturers of all kinds of **Saddles, Stirrups and Levers.** Send for Samples and Prices.

Spinners' Supplies in general.

ANYTHING

Entire Outfits for New Mills, or small and odd items that you don't know just where to obtain, can be found at the

AMERICAN SUPPLY CO.
PROVIDENCE, R. I.

in Mill Supplies.

ELIJAH ASHWORTH,

MANUFACTURER OF

Card Clothing of Every Description

FALL RIVER, MASS. HENRY ASHWORTH, Agent.

IMPORTANT TO COTTON MANUFACTURERS...

I Guarantee An Increase of 6 to 10 Per Cent in the Production of Any Card Room Using My Invention.

I have recently perfected and am now placing on the market under a U. S. Patent, an attachment to a lapping machine, the use of which positively insures a smooth and even lap that will unwind from start to finish without sticking or splitting; thus insuring the continuous running of the carding machine without choking or splitting of the laps, and the consequent loss of time and production, besides improving the quality.

This device is simple in construction, durable, and the cost is so little that no concern that wishes the best possible results for the smallest cost can afford to be without it.

It can easily be attached to a lapping machine of any make without any change in the machine.

I guarantee an increase of from 6 to 10 per cent in the production of any card room adopting my attachment on its lapping machines. Will prove my claims of forfeit cost of device. Correspondence solicited. All inquirers cheerfully and promptly answered.

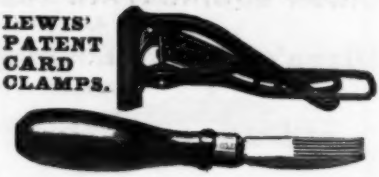
W. J. HURLEY, Kimesville, Guilford Co., N. C.

BIRCH BROS.,
Somerville, Mass.
Mill Sewing Machines.

Sews any fabric, wet or dry, thin or thick, fine stitch or coarse stitch.
SEND FOR CATALOGUE.
Bleaching, Dyeing and Finishing Machinery.

CARDER'S TOOLS.

LEWIS' PATENT CARD CLAMPS.



Gardner & Reid's Card Tooth Raiser,
For Setting Up Bent Teeth of Card Clothing, with a variety of other tools used by Carders and Manufacturers. Send for circular.

W. H. BROWN,
No. 81 Mechanic St., WORCESTER, MASS

Burr Bobbin Holder & Thread Catcher Co.
86 Pratt St.,
HARTFORD, CONN.
makes a device to
HOLD BOBBINS FIRM
on
Mules, Winders, Twisters, etc., and **Catch Threads** when doffing. **Pays for itself in six months.**
Mail spindle, bobbin and sample of strongest yarn you make and we will fit one to spindle and return free of charge.

PARIS. BERLIN. LONDON.
EUROPEAN PATTERN SUPPLY CO.
32 Creene St., New York.
Largest assortment, being continually added to, of latest European Novelties, in Designs for Men's Woolens and Cloakings.
Subscription $80.00 Per Annum. **Single Patterns According to their Value.**

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Manufacturers of
SCOURING SALTS,
Wool Bleach and Fast Wool Mordants,
Correspondence Solicited..... **235 North Front Street, Philadelphia.**

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ASHLEY B. TOWER, M. AM. SOC. C. E.
BROADWAY AND 25TH ST., NEW YORK.

ARCHITECTS AND ENGINEERS.
Cotton, Woolen and Silk Mills.
POWER DEVELOPMENT AND TRANSMISSION.

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NO. 4 SPECIAL
SPINDLE HOOK BAND
Which we are selling at **$6.00 per 1000?**
The finest article on the market to transmit power from cylinder to spindle on Silk, Cotton, Woolen and Flax Spinning Machinery.
Send today for free samples, stating what lengths of Bands required.
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Paterson, N. J.
Manufacturer of and dealer in Mill Supplies

COMB CIRCLES
Fallers and Gills,
and all kinds of GILL COMB and CARD PINS, and PICKER TEETH.
PRICES REDUCED.
WILLIAM CRABB & CO., Newark, N. J.

ECO Magneto ELECTRIC WATCHMAN'S CLOCK.
Write for Circular
Eco Magneto Clock Co.,
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LINK-BELT Elevators . . . AND . . Conveyors

For handling Cotton and Woolen Bales, Rolls, Spools, Bundles, Coal, Ashes, Etc., of any capacity, designed and erected.

ROPES, SHEAVES, SHAFTING, PULLEYS, GEARING, CLUTCHES, Etc.

. . . Send for Catalogue . . .

Above cut shows the LINK-BELT CARRIER handling 550 Bales Cotton per hour.

The Link-Belt Machinery Co.

ENGINEERS. FOUNDERS. MACHINISTS.

Southern Department, CHICAGO, U. S. A.

710 Union Street, New Orleans, La.

W. G. WILMOT, Manager.

LINK-BELT ENGINEERING CO., PHILA. & NEW YORK.

The Standard of all Transmission Ropes.

Has been Tested by the Largest Users in the Country.

AJAX runs the longest and largest drive in the world at Pensacola, Florida.

AJAX drives the new mammoth grain elevator, in Manchester, England.

AJAX drives the great machinery of the Illinois Steel Company.

USE AJAX AND RUN NO RISK OF ACCIDENT.

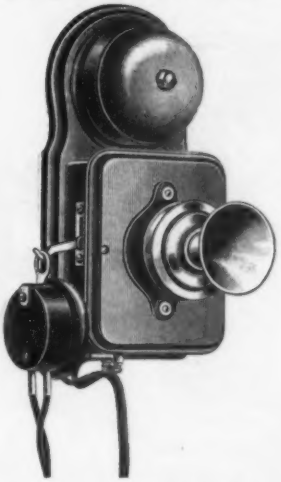
H. CHANNON COMPANY,

24 and 26 Market Street, Chicago.

Telephones

—FOR—

HOUSE or FACTORY.



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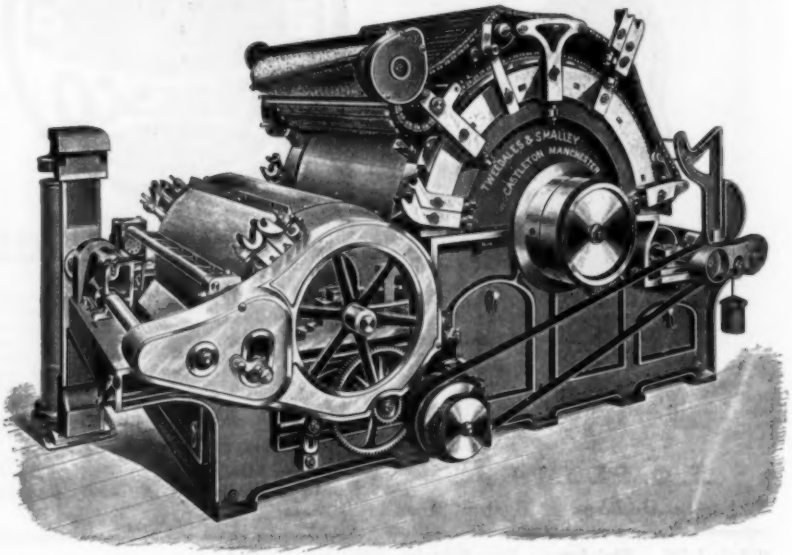

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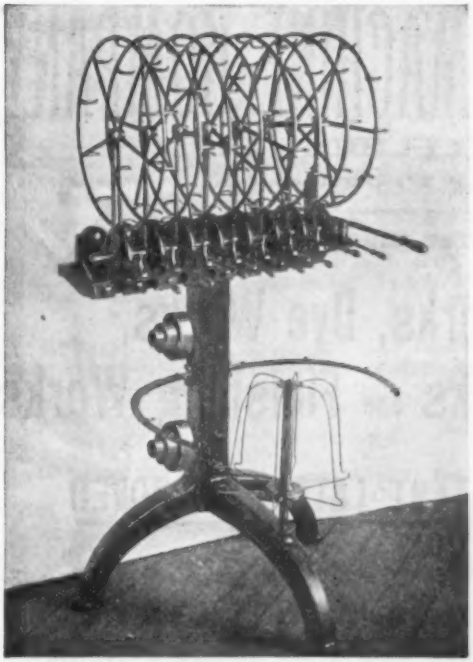

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Special quarterly issues are published in January, April, July and October; one (January) being a statistical issue, and the others devoted especially to the cotton, knitting and woolen branches, respectively.

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Mr. George W. Gregory, of Crosby and Gregory, has taken out for us since January 1875, more than two hundred patents.

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List of Textile Patents.

Issued August 29, and September 5, 12 and 19, 1899.

Bobbin. 632,132. Henry A. Mack, Weatherly, Pa., assignor to the H. A. Mack Wood Working Co., same place.

Bobbin-Holder and Thread-Catcher. 632,473. John Roney, Woonsocket, R. I.

Braiding and Winding Machine Spool-Carrier. 632,318. John McCahey, Providence, R. I., assignor to the N. E. Butt Co., same place.

Braiding Machine Spool-Holder. 632,534. Ewald Mundt, New York City, assignor to Wm. Mundt, same place.

Cap-Spindle. 633,302. Edmund S. Whitaker and John Chadwick, Providence, R. I.

Cloth Cutter. 633,321. Marshall D. Kitchen, Chicago, Ill.

Cloth, Pressing. 633,388. George H. Nussey and Wm. B. Leachman, Leeds, Eng.

Cloth-Steamer. 633,238. David Gessner, Worcester, Mass.

Cotton Chopper. 632,470. Wm. McGillivray, Gonzales, Tex.

Cotton-Distributer. 633,479. George Ogden, Ogden, Texas.

Cotton Gin. 632,685. Abner D. Thomas, Little Rock, Ark.

Cotton Opener Evening Device. 631,795. Frederick H. L. James, Pawtucket, R. I., assignor to the Saco & Pettee Machine Shops, Newton, Mass.

Cotton Press. 11,769. Chas. E. Mallett, New York City, assignor of one-half to Chas. T. Harbeck and Edmund Urquhart.

Dyeing. 633,438. Franz Erban, Hochst-on-the-Main, Germany, and Leopold Marienthal, Austria-Hungary.

Dyeing Khaki. 631,906. John T. Reid and Henry Thorp, Pendleton, England.

Dyes, Making. 633,245. Leon P. Marchlewski, Manchester, Edgar S. Wilson, Strood, and Ebenezer Stewart, London, England.

PATENTS DESIGNS TRADE-MARKS AND COPYRIGHTS OBTAINED

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Fabric Trimming Machine. 632,314. Robert Le Fort, Philadelphia, Pa., assignor to Pollitz, Kaufman & Co., same place.

Fibres, Machinery for Decorticating Vegetable. 633,507. Robert J. Eke, London, England.

Fulling-Mill. 632,119. Addison S. Hopkins, Bridgeton, R. I.

Humidifier. 632,185. Arthur L. Jones, Montgomery, Ala.

Knitting Machine Striping Attachment. 631,963. Walter Coult, Needham, Mass., assignor to the John F. Brooks Company, same place.

Knitting Machine. 632,327. George F. Sturgess, Leicester, England.

Knitting Machine. 632,872. Frank Lasher and Charles S. Beach, Bennington, Vt., assignors to the Lasher Stocking Company, same place.

Loom. 632,975. Patrick E. Victory, Dayville, Conn., assignor of one-third to Clarence H. Truesdell, same place.

Loom Heddle. 632,834. John Cocker, Halifax, England, assignor of two-thirds to John Crossley & Sons, Ltd., and Matthew Graham Dobson, same place.

Loom Shedding-Motion. 633,131. Robert B. Goodyear, Philadelphia, Pa., assignor of one-half to the Bridesburg Machine Co., same place.

Loom Shuttle. 632,209. Edward S. Stimpson, Hopedale, Mass., assignor to the Draper Company, same place and Portland, Me.

Loom Wefting Mechanism. 633,020. David J. MacDonald, Dundee, Scotland.

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Silk Fibres, Apparatus for Opening. 631,992. Louis B. Magid, Boston, Mass., assignor to the Magid-Hope Silk Manufacturing Company, Portland, Me.

Spindle and Bearing. 632,989. George O. Draper, Hopedale, Mass., assignor to the Draper Co., same place and Portland, Me.

Spinning Machine. 632,172. James Buckley, Liverpool, England, assignor of two-thirds to John Henry Buckley, Chew Moor, and Elijah Ashworth, Manchester, England.

Textile or Analogous Machines, Device for Weighting Rolls in. 632,947. Franklin P. Rand, Providence, R. I.

Warp Stop-Motion, Electrical. 632,004. William H. Baker, Central Falls, R. I., and Frederic E. Kip, Montclair, N. J., assignor to the Kip-Armstrong Company, of New York.

Wool-Fat into its Products, Separating. 632,791. Carl Schmidt, Madgeburg, Germany.

Prices for Cotton Yarn.

The Southern Cotton Spinners' Association, which held meetings, of late, in Philadelphia, adopted a new scale of prices as follows:

Two-ply warps—8-3, 12½c; 8-2, 12c; 10-2, 12½c; 12-2, 13c; 14-2, 13½c; 16-2, 14c; 20-2, 15½c; 22-2, 15¾c; 24-2, 16c; 26-2, 16½c; 30-2, 18½c.

Single warps from 1c to 1¼c less than this scale.

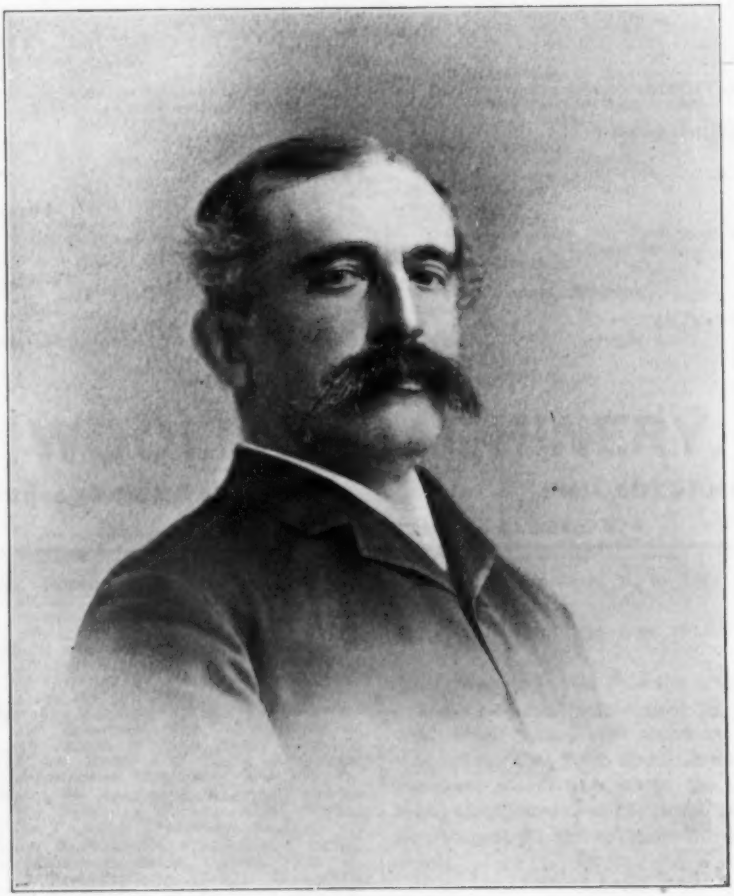
Two-ply skein ½c less than this scale.

Single skein 1c less than this scale.

The agreement was signed by sixteen firms from North Carolina. It was stated that New England manufacturers would also adopt the new scale, and that unless the prices could be obtained all the mills would close down.

Working Overtime.

The press of orders has necessitated overtime work by the Philadelphia Textile Machinery Co., and from seven in the morning until nine at night is their present working schedule, which is likely to continue for some months at any rate. Although it is a long day, the mechanics have no complaint to make, as the extra time is well compensated for by the extra payment. The mill public evidently appreciate their "Cyclone" dryers, for all sorts of drying purposes in textile mills, and an unusual number of orders are being placed for them, as well as for their Proctor garnett machines and pickers and their improved willows and dusters.



HORATIO N. SLATER

TEXTILE WORLD.

Vol. XVII. OCTOBER, 1899. No. 4.

HORATIO N. SLATER.

The sudden death of Horatio N. Slater, of Webster, Mass., due to heart failure, brought on by over exertion, was a shock to the textile manufacturing industry. When a man of force drops out of a business community, his demise is a matter of general interest and much note.

Mr. Slater's death occurred at Magnolia, a summer resort near Boston, where he, with his family, were staying for the season.

Mr. Slater was born in Providence, R. I., in 1835, and received his education at Brown University and the Harvard Law School. He was a son of John Slater, who was a brother of George and Horatio Nelson Slater, three sons of Samuel Slater, the latter generally recognized as the father of the cotton manufacturing industry in the United States, and who, at a late period in his life, built a factory at Webster, and thus founded the textile industry in that place.

Mr. Slater's father, John F. Slater, died at an early age. The old business partnership was long known as Samuel Slater & Sons, and saw its 100th anniversary some years since.

Mr. Slater's uncle, Horatio N. Slater, whom he succeeded as head of the large manufacturing business, married his father's widow, so that the deceased was both a step-son and nephew.

The dissolution of the old firm of Samuel Slater & Sons took place about 1875, when the interests of George Slater, represented by Madam L. R. Slater, of North Webster, not long since deceased, and her son, William S. Slater, drawing out, so that the burden of the business was assumed by Horatio N. Slater; his nephew, the late Horatio N. Slater, standing by him in carrying the load of manufacturing interests which he thus assumed.

It is a mistake to say that the subject of our notice received the great part of his fortune by inheritance. When his uncle, to distinguish him from whom the "junior" was added to his name by common consent, took upon himself to carry on the great business of the family, it was in the midst of hard times that had commenced as early as 1873 and lasted until some years after 1876.

The late Mr. Slater, familiarly known as "junior" from that moment, gave his unstinted attention and labor to the busines in which he became a prominent figure. He had been engaged in the business of Samuel Slater & Sons for a long time before, but in a less conspicuous and less laborious connection.

Mr. Slater employed one-third of the entire population of the town of Webster, fully two thousand hands being employed at the three manufacturing establishments, in addition to which he had one at Wilkinsonville. The most important manufacturing plant under his control and ownership is the Slater Woolen Company, which has a world-wide reputation for its products, consisting principally of broadcloths, doeskins, carriage cloths, etc., and has in past years furnished the government with large quantities of cloth. The company was incorporated in 1865 with a capital of $500,000.

The East Village cambric mill conducted independently by Mr. Slater in connection with his North Village plant employs about 200 hands.

It is at the North Village mill where

Mr. Slater placed the bulk of his energy the past few years, almost doubling the capacity of the plant. A two-story structure, 300 by 125, and a four-story building, 285 by 100, have been erected the past two years, and when all the new machinery is in place the plant will have 2000 looms in operation. The village itself has been improved by seven substantial tenement houses to accommodate the help needed by the new additions.

Mr. Slater was twice married, his first wife being Elizabeth Vinton, who was killed by an accident in Providence. His second wife, who survives him, was Mabel Hunt.

Mr. Slater leaves six children, Mrs. Charles G. Washburn, of Worcester, Samuel Slater of Bar Harbor, Me., and four small children.

Many an act of unostentatious private charity and of kindly help testify to a kind heart in him.

The National Export Exposition.

The National Export Exposition is now being held at Philadelphia, and will continue open until the last of November. It is an exposition of which Philadelphia, noted, as the Quaker City, for its co-operation in commercial matters, may feel that all previous efforts, with the possible exception of the Centennial, in 1876, have been surpassed.

In order that the magnitude of the enterprise may be appreciated, it should be stated that the Exposition grounds comprise no less than 62 acres. These grounds are admirably located, being easily accessible from all parts of the city, both by electric cars and the steam railroad lines. They are on the west bank of the Schuylkill River, within ten minutes' ride of the City Hall. Fifty-six acres were deeded to the Philadelphia Museum by the city of Philadelphia, and another tract of six acres was secured for the uses of the Exposition.

The main building, though now for all practical purposes one structure, consists in reality of five separate structures. Of these five, three—the north, central and southern pavilions—are permanent two-story buildings of brick and steel, designed to become ultimately the home of the Commercial Museum. Each of the three is 380 feet long and 90 feet wide. Congress appropriated $300,000 for these buildings and the State appropriated $250,000. The space between these pavilions is covered by temporary buildings, connected with the permanent structures so as practically to form one immense building. The temporary building between the northern and central pavilions is 300 by 297 feet. It comprises an auditorium and music hall, 200 feet long and 140 feet wide, with arcades for exhibits on each side 300 feet long and 78 feet wide. Between the central and southern wings there is an immense exhibition hall 383 by 297 feet in size. The exhibition spaces on the first floor of the wings open into the main hall through wide arches, so that the entire area of 167,200 square feet, 563 by 297 feet in dimensions, is practically a single open space. The entrance to the main building is through a broad lobby, 60 by 90 feet in size, in the centre of the northern pavilion.

No complete list of exhibits is yet available, but in a general way they may be said to embody leading manufactures of articles of all kinds that are now being exported or for which it is thought that an export demand can be created.

Of course the prime idea of the Exposition is for the advertisement of American trade abroad. This was the original conception, and it is certainly novel and interesting.

The Exposition is the outgrowth of the Philadelphia Commercial Museums. Dr. Wilson, head of the Museums, is Director-General of the Exposition, and largely through his untiring efforts has the great project been brought to its present enviable state. Through him the co-operation of the United States Government, the State of Pennsylvania and the city of Philadelphia was secured.

TARIFF ON RAGS.

The United States General Appraisers have recently made a decision regarding the duty on clippings of woolen cloth, the waste resulting from the process of cutting the cloth to make garments, to the effect that they are dutiable as woolen rags, and not as wool waste, as contended by the importers, and supported by some influential knit goods manufacturers, who are apparently interested in having a 20 cent per pound duty on such merchandise, as woolen waste, instead of ten cents per pound, as woolen rags, as provided by the tariff.

We commented editorially, taking decided views in regard to the classification of such merchandise, in our September issue, 1898. These views of ours were commented upon in the New York press and elsewhere, and excited the opposition of some of those influential manufacturers alluded to. The attempt to relegate pieces of woolen cloth, designated in the market as "woolen clippings," on the ground that they are not woolen rags, seemed to be so inconsistent with the truth that we have been astonished that any manufacturer, familiar with such merchandise, could stultify himself to the extent of advocating a tariff classification that could not be looked upon as otherwise than absurd by one at all conversant with the meaning of this term and its relation to the ordinary woolen rag of the trade.

The importation that was passed upon was classified by the New York custom house appraiser as "wool waste," subject to 20 cents per pound duty, because, as he stated: "It is not bought or sold in the trade as rags, nor is the price at which it is invoiced the usual price for rags." We might say that the importation consisted specifically of clippings of knit goods that were made into garments. Notwithstanding this, however, we contended at the time, in which view the general appraisers now concur, that this fact did not take them out of the category of ordinary woolen rags. The general appraisers reached the same conclusion as we did, that the word "rags," as used in the tariff, is not limited in its commercial application to old, worn-out cloth, but includes waste or cuttings of cloth that fall off in the process of making garments.

There have been importations at the Boston custom house within the last year, for the purpose of testing the tariff law in regard to the classification and the proper rate of duty. These importations, so far as we know, have passed the custom house at the duty imposed upon woolen rags (10 cents per pound), and to that extent the Boston appraiser has not agreed with the views of the New York appraiser.

TEXTILE MILL COMBINATIONS.

The combination kaleidoscope is changing so rapidly nowadays, regarding the incorporation of textile mills under one management, that it becomes somewhat hazardous to state facts and pass opinions today, for fear that they will be materially modified before tomorrow.

The status of the cotton mills of Fall River, at present writing, is extremely uncertain, and no one seems to have any confirmed opinion as to what the outcome will be. The indications at present are against any deal being made with what is known as the Barrow, Wade, Guthrie & Company syndicate, due chiefly to the indisposition of the Brayton interests, as represented by Treasurer T. E. Brayton of the Union Mills, to endorse the proposition made by this syndicate. The endorsement, however, is apparently withheld because the price offered for the Union Mill stock and others is below their estimated worth, which may be taken as the prime incentive for the Brayton opposition.

The scheme for a local combination is assuming more definite shape, but what the result regarding it will be, we are unable at this moment to say. Great interest is taken in it, however,

by the public and by many of the large corporations. Many of the treasurers and the local banks favor such a combination, though under some trust plan, by which the present corporations shall retain their separate existence. This latter would be more acceptable with local banks than anything that has yet been suggested.

We note in these various combination schemes that the general corporation law of Delaware, which was approved last March, is being taken advantage of by quite a number. Among them may be mentioned the Mt. Vernon-Woodberry Cotton Duck Company, with an authorized capital of $9,500,000; the Rotary Ring Spinning Company, with an authorized capital of $5,000,000; and the National Coal Tar Company, with an authorized capital of $1,000,000. The first mentioned has been organized with the control of nearly all the cotton duck companies of the country. Mayor Josiah Quincy, Boston, is the president of the Rotary Ring Spinning Company, which is to manufacture a rotary ring for spinning cotton yarn, that is thought to possess merits of a revolutionary character, by which the spinning capacity of the frame can be doubled without affecting its efficiency for good work.

The apparent object of incorporating under the Delaware law is because of its greater leniency than the New Jersey statutes, the taxes being only one-half as much, for example. Then again, the stockholders are not required to meet in Delaware, or to keep the books there. Only one incorporator need be a resident of the State, and the company may begin business when only $1000 of their capital stock is paid in. In this State, the company may amend its charter, or dissolve itself, increase or decrease its capital stock, own or merge with other corporations, and may own and vote on the stock of other corporations.

THE COTTON CROP.

We were unable to make any reference to the annual crop statistics published by the Commercial and Financial Chronicle, New York, in our September issue, as we went to press before it was received. The annual report of this authority has long been looked upon as being the most important and reliable that is published. While this may have been the case in years past, we think that any honor of this kind should be divided at least, with the annual report of the New Orleans Cotton Exchange, as made out by its secretary, H. G. Hester. However, these two authorities arrived at about the same estimates of the total cotton crop for 1898-99, Mr. Hester placing it at 11,274,840, while the Chronicle places it at 11,235,383 bales, a difference between these authorities of only 40,000 bales, which is a variation of scarcely three-tenths per cent. Notwithstanding the cotton crop for last year was larger than that of the previous year, the receipts at the several ports were less; but the increase in the overland movement more than made up this loss. This shows what a potent factor the railroads are in the movement of the cotton crop.

While the total takings of American mills for the last season amounted to 3,647,118 bales, the Chronicle makes the actual consumption 3,721,026 bales. The statistics in detail are as follows:

	1898-99. Bales.	1897-98. Bales.	1896-97. Bales.
Stock beginning of year	499,775	79,696	52,131
Takings	3,647,118	3,504,018	2,887,047
Total	4,146,893	3,583,714	2,939,178
Stock end of year	425,867	499,775	79,696
Year's consumption,	3,721,026	3,083,939	2,859,482

In speaking of the rapid increase of the cotton manufacturing industry of the South, the Chronicle remarks that "We are not permitted to doubt that if this stimulus continues to operate in the future as in the past, fostering and quickening the growth of spinning power in the South, a time will come when the state of too many spindles for even full consumption will become an actual fact."

This state of affairs has engaged the attention of economists for the last few years, in the belief that the South

will soon feel a pressure of scarcity of white labor, and the necessity of enacting laws for shorter hours of operation. The first will be brought about by natural laws, and the second through the efforts and agitation of labor organizations, which have already obtained foothold in some of the manufacturing centres. A pointer in this direction is the following news item from South Carolina:

"Reports indicate that the cotton mills throughout the Piedmont section of this State, as well as points in North Carolina, are having considerable difficulty in securing a sufficient number of operatives to keep the mill machinery running on full time. This is in a large measure due to the great increase in the number of looms and spindles put in operation during the past six months. It is said that the mills at Chester, Rock Hill and Fort Mill have recently advanced their scale of wages, and still are unable to get all the needed help."

Whether the cost of labor will be kept on on a comparatively low level in the South, is a problem which economists have not reasoned out to any satisfactory conclusion, because of the uncertain element to be considered of the black labor that can be depended upon. The black man in the factory has not yet had a full opportunity of showing his capabilities as a desirable operative. Some decided and well planned demonstration in this respect will undoubtedly be made before long, but the first time, probably, will result in a partial, if not a complete, failure, if attempted without any previous factory training on the part of the help.

The Chronicle makes the number of spindles in the South 3,987,735, and in the North, 13,950,000, giving a total of 17,937,735 in the whole country, being a gain for the South of 317,445 spindles, and for the North, 50,000 spindles as compared with the previous year. The increase has been more largely in mills already established, through new additions, than in the organization of new mills, though the net addition to the spindle power was 108,758 in twenty-three new mills.

TARIFF ON WOOL.

Any discussion regarding the tariff on wool seems to be somewhat out of place at the present time, as the business interests of the country have settled down with the impression that the tariff is an issue that has been laid aside for some time to come, as being as equitable as it can be reasonably made, consistent with the idea of protection. There is a feeling throughout the country that no disturbing element, as the discussion of the tariff would be, should be introduced into Congress, because of its militant influence upon business. The business of this country is altogether in a too prosperous condition to submit to the introduction of any factor that would disturb its present equilibrium. We do not think that the wool growers of this country are at all desirous to bring the matter of a tariff on wool into any measure to be discussed by Congress. The time is not ripe for anything of this kind, and the only ones that seem to take any satisfaction in writing or talking upon this subject are such men as those who set up the methods of the late Judge Lawrence as a desirable model or example to follow.

There is a party by the name of W. H. B. Thornton, who is writing a series of articles in a Chicago publication, on "Wool Tariff Incongruities." We doubt very much if his articles are having any influence among wool growers, and it is doubtful if they are worth noticing; still, this writer is persistent in promulgating his views among sheep men, denouncing the present tariff on wool, and accusing the manufacturers of wool of promoting schemes of treachery to the wool grower. Instead of accusing the manufacturers of treachery, it would be much more consistent to the truth if some expression of gratitude was extended to them, because of their disposition not to antagonize an equi-

table tariff upon the raw material, and finally consenting to or not opposing a plan that established rates of duty that are almost prohibitory to foreign importations. This Mr. Thornton devotes a great deal of space to severe criticism, of having in the tariff a classification with special reference to English blooded combing wools, known as second class; and its existence he regards as but one of the plans of crooked importers and foreign manipulators, to work out their schemes. If Mr. Thornton had examined the import statistics of this class of wool, he would have observed that it has figured inconspicuously in the government statistics, so much so that it could be taken entirely out of the figures of imports without materially affecting the results of the total wool imports.

Mr. Thornton makes a statement, which some are inclined to believe, that the tariff in itself, has the power of regulating values and preventing spasmodic conditions to exist in the market affecting prices. Anyone with ordinary common sense ought to be able to see that the tariff has no influence upon conditions of trade, affecting fluctuations in price, and that the only possible affect that it can have upon prices, is to keep them above foreign values. If this latter cannot be accomplished, there are causes other than the tariff that should be sought, and which no law that can be enacted can prevent.

RAISING THE PRICE OF COTTON.

Some of the oddest ideas in economics come from the brains of Texans, as noted in a recently proposed scheme for organizing a trust law with a capital away up in the thousands, under the laws of Texas, for regulating the price of cotton by its purchase and sale, and even manufacture. The proposition finds favor as an attractive method for counteracting the influences of moneyed combinations said to exist in the North among manufacturers, who are at all times said to be bringing pressure upon the planters, so that they will be obliged to dispose of their crops at a figure below the cost of production. Representatives and ex-representatives to Congress are said to be interested in this movement, and propose to elicit the attention of the National Congress to a scheme of this kind for improving the financial condition of cotton planters. It has been suggested that the cotton planters of the South come together and appoint a committee of five, for instance, who know the cotton business in the two capacities of planter and broker, selecting members of this committee from the principal cotton States, for the purpose of receiving all the cotton raised in the South, and to make sales to parties at a price that will give a profit to the planters, and if this price cannot be obtained from manufacturers or buyers, then the cotton shall be held, on the belief that it cannot be obtained from any other source. Some of these interested parties confidently expect to raise the price of cotton to eight or nine cents per pound, and thus bring material prosperity to the South. Quite a number of Southern papers upon our exchange list advocate these propositions, in the apparent belief that they are practicable.

OUR RAILROADS.

The internal commerce of our country may be measured by the increased facilities of transportation, which have now reached comparatively enormous proportions, from the beginning, in 1828, when the railroad system of our country had its birth, with the construction of the Baltimore & Ohio Railway, which, when first opened for traffic was operated by horse power, but steam locomotive traction was speedily substituted. The total miles in operation, of railway, in 1830, was only 23, and at the opening of the Civil War, it amounted to but 31,286; but, in 1898, it had increased to 186,810 miles. It has bound the states of the Union into one community, such as no other means

could have done, not excepting post-office facilities, which depend wholly upon the conveniences of railway transportation. The introduction of steel rails, even at a lower cost per mile than iron rails, has greatly increased the economy in railway operations. In 1880, the per cent. of steel rails used was 29.1, while in 1898 it had reached 90. In 1898, the greatest increase in railway construction was in the Southern states, it being particularly marked in the states of Arkansas and Te as.

HAND AND MACHINE LABOR.

The thirteenth annual report of the Commissioner of Labor, Washington, D. C., is devoted to hand and machine labor, and contains much statistical matter of value to students, but, for the general reader, it is too voluminous and intricate to be clearly understood, or to be practically utilized. The statistics cannot be read exactly as they are exhibited without understanding the conditions surrounding them, and, therefore, their analysis, as presented by the commissioner, must be studied.

The report is the result of an investigation authorized by a joint resolution of congress, empowering the commissioner of labor to make a report upon the effects of the use of machinery upon labor and the cost of production, the relative productive power of hand and machine labor, the cost of manual and machine power as they are used in the productive industries, and the effect upon wages of the machinery operated by women and children. In many respects the investigation is unsatisfactory, and not conclusive, in dealing with an economic question of this kind. This defect militates against its economic usefulness, as enabling one to reach any definite conclusion concerning such an important question as the effect of machinery as compared with hand labor. The commissioner, in his prefatory remarks, practically admits this phase of the question, when he says: "The general tendency of wages since the introduction of power machinery and the employment of women and children in its operation has been upward, but it will be difficult to decide positively whether such increase is due absolutely to the use of machinery or to a higher standard of living, or to the increased productivity of labor, supplemented by machinery, or to all these causes combined, or to other causes." Therefore, a great deal is left to the investigator of the statistical presentation of facts, to reach any decisive conclusion. The commissioner further says, which has long been known to be a fact, that "under the machine method, there is, as a rule, an increased demand for labor."

This latter status may be noted in the fact as presented concerning the manufacture of cotton goods, that while three persons can do a certain amount of work by hand, it requires 174 persons to do the same amount by machinery; but, while it requires 5164 hours to do this work by hand, it requires but 78 hours to do it by machinery. This is accounted for by the fact that when the work is performed by hand, one person does a larger proportion of the resultant product than when done by machinery. The labor cost by machinery is reduced, because of the less number of hours that are demanded to perform the same amount of work. In the manufacture of cotton goods, the labor cost of hand work, as compared with machine work, stands in the ratio of 21 to 1, and while there are 16 different operations by hand labor, there are 42 different operations when performed by machinery. In the manufacture of cotton yarn and thread the labor cost of hand to machine work stands in the ratio of 60 to 1, and in the manufacture of men's clothing, this cost of labor stands in the ratio of 23 to 7½. These are our own deductions from the statistics given.

Edward Atkinson, in his publication in 1885 on "The Distribution of Products," gives some interesting statistical facts of actual results, and makes a comparison between the wages earned

by hand labor in the mountainous sections of the Southern United States, and machine labor in one of the New England factories. He took an instance in the Southern States, of five women (two carders, two spinsters, and one weaver), producing eight yards of cloth per day. These women turned off 2400 yards a year, while the same number of persons in a New England factory would turn off 140,000 yards of the same class, but better quality, of goods. The labor cost in these two instances was found to be 58.49 cents per yard, performed by the Southern operatives, against 1.08 cents per yard performed by the New England factory operatives, which gives a ratio of 54 to 1 in the relative cost of labor.

The difficulty of comparing hand labor with machine labor is greatly enhanced because of the impossibility of securing the same product obtained by hand as by machine labor, which must be taken at two different periods, many years apart, as there are few examples of hand labor today that can be used for comparative purposes. An article made today is found to be much superior to the one made years ago by hand. Take for example the plough, and it is seen that this instrument made by hand differs very essentially from that produced by machinery of today. The hand plough was made with two moldboards, with plated joints, while the machine-made plough of today is made largely of cast iron, in place of wood. The plough of today is stronger, more durable, and better in all ways than the old hand-made one; and if the facts could be ascertained, the same could also be made to apply to the manufacture of any line of textile fabrics. These things are difficult to present in figures, and to that extent it makes all statistics relating thereto difficult to measure comparatively.

A New Textile Plant.

Consul Atwell writes from Roubaix to the State Department, Washington, D. C.:

Some years ago, an explorer in Asia discovered a plant of silken fibre, used by the Turcomans for the manufacture of withes and cord and by the Canagues for woven goods. This plant, known as the Apocynum venetum, is a sort of bush with slender cylindrical branches, sometimes 6 feet high. It grows in Europe, Siberia, Asia Minor, the north of India, Manchuria, and Japan; but it is not cultivated, and, up to the present, has been used only in the natural state. The branches die yearly, and in the spring new shoots start horizontally from the roots. It flourishes best where the land is under water during a part of the year, notably in the neighborhood of rivers that overflow at stated periods.

Under favorable conditions, the Apocynum develops quickly, and in a short time the branches form a thick growth, almost like a miniature wood. The best fibre is obtained by cutting the branches in midsummer, when the plant has obtained its full growth.

The attention of the Russian Government was called to this plant in 1891. It is there known as the Apocynum sibericum, because it was first seen in Siberia.

It grows luxuriantly on the banks of the Amu, Darya, and the Ili, and the natives of these regions have used the fibre for many years for cord and fish nets. They value it not only for its great strength, but also because no care is required in its cultivation.

In 1895, the Russian Government began to use it in the manufacture of bank notes, and since then the plant has been cultivated at Poltava. The results obtained thus far are considered excellent, and the time is doubtless near when the Apocynum venetum will take an important place in the textile market.

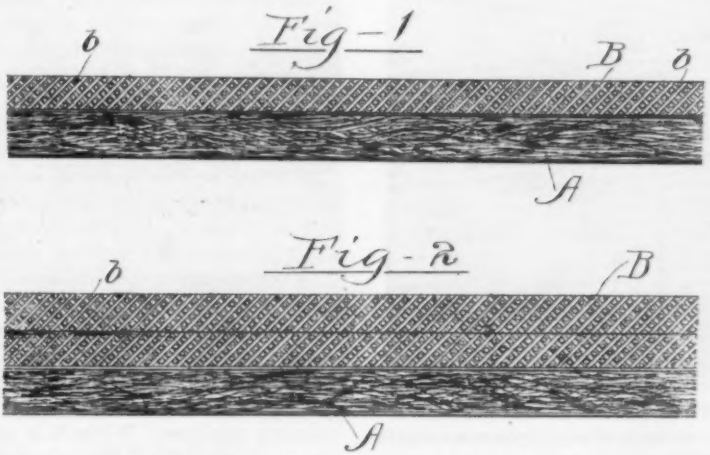
—In 1675 the Massachusetts colony adopted the policy of prohibiting the exportation of wool, of which some had already been sent to France from Nantucket, where sheep husbandry was very early and successfully practiced.

A Bullet-Proof Fabric.

Many attempts have been made to construct a fabric that will be proof against the penetration of bullets fired from pistols, but we do not bring to mind any success attending inventions of this kind, unless it be one that has recently come to public notice, because of its adoption by the city of Chicago for the equipping of its police force for use when any members of it are required to perform police duty involving danger to their lives while patrolling dangerous districts or when sent out to arrest criminals or dangerous characters.

The fabric that has been so favorably considered by the police department of Chicago is the invention of Casimir Zeglen, a foreigner, although a resident of that city. The cloth before its adoption was tested by members of the police department discharging their weapons against it, which stood the test without being penetrated by the bullets. The police authorities of Chicago became thoroughly satisfied as to the ability of this cloth to withstand the force of a bullet fired at close range, and considered it impenetrable.

Two crack shots of the Fourteenth United States Infantry, stationed at Fort Sheriden, made a test of the power of resistance of this "bullet-proof" cloth by firing against it a 2-inch steel bullet from a Krag-Jorgensen rifle that under favorable conditions will make a hole in an armor plate. The range was 400 yards, and the bullet struck the cloth target almost in the centre, but instead of penetrating it, merely tore a gaping hole less than half an inch deep, and fell to the ground broken and twisted. The target was 16 inches long, 24 inches wide, in a double layer, 4 inches thick. It developed during the test that, when hung against a hard substance or body, the bullets striking the cloth become flattened and make a dent in the hardened substance or body without perforating the cloth; and when the cloth is placed over a soft substance the bullets which strike the cloth become less flattened and



seem to take less effect upon the cloth, and leave only a mark in the place where they come in contact with the cloth. A second shot was fired at a range of 350 yards and it was more successful from the standpoint of the riflemen, because the bullet imbedded itself in the cloth a distance of about a quarter of an inch. To have been fatal to a man wearing the armor, however, it would have had to penetrate not less than three and one-half additional inches of the texture, and this it could not do from the range taken. At 300 yards the steel missile sank deeper into the cloth and at 250 yards it penetrated more than half of

its thickness. The fifth and last shot, fired from a distance of 200 yards, gave the new rifle an advantage that was nearly too much for the cloth. The bullet plunged right through the texture until the sharp point penetrated from the side nearest the effigy about a sixteenth of an inch, but it did not go through. The spectators figured that at a distance of 100 yards or less a bullet might go all the way through, but an army officer expressed himself satisfied with the 200-yard test and brought the experiment to an end.

It was the opinion, however, of the army officers that the cloth can never be used for anything except a shield,

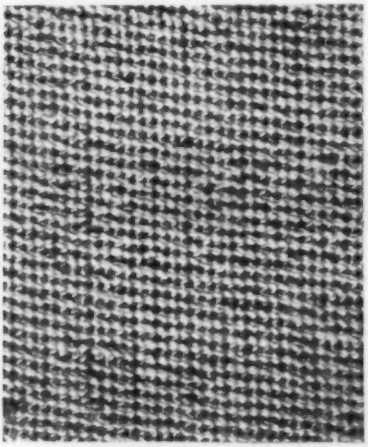


FIG. 3. ¾ IN. THICK.

and as such it might prove a valuable addition to the accoutrement of an army in the field.

It is said that projectiles of the kind used in the experiment fired from a Krag-Jorgensen rifle have a velocity of 2100 feet per second, at a range of 300 feet, and will kill a man two miles off. They will pass through twenty-seven inches of packed sand, pierce twenty-two inches of oak timber, and fired from a distance of 600 yards will pass through five feet of earth.

Believing that our readers would be more or less interested in this cloth, we sent to the inventor for samples of it, which we have received and herewith illustrate two styles of it (Figs. 3 and 4), the first being ½ inch in thickness and the second ¼ inch in thickness. These are placed in layers according to the requirements to be made of the cloth.

We also give drawings representing cross sections of the fabric arranged in layers. (Figs. 1 and 2.) The fabric can be woven on eight harnesses. Fig. 3 was made at Aachen-Germany on a jacquard loom, and Fig. 2 was made in this country by the inventor on a loom of his own construction. The inventor says that the secret of the fabric is in the weaving and in the material, which, in the samples sent us, is silk. For the latter he has taken out a patent, but for the method of weaving his patent is somewhat of a general one.

The fabric consists, essentially, of layers of strong cords or strands, of silk, the strands in each layer being laid parallel with one another, while the strands of the different layers are laid transversely with relation to one another.

Referring to Figs. 1 and 2, A designates one of the layers of the fabric, and may consist of a layer of fine fibres placed parallel with one another. It is unnecessary that the fibres of this layer be placed parallel or in any regular order with relation to one another; but the fibres may be superposed upon one another in any manner, it being only desirable to secure a uniform and compact thickness. While it is desirable to confine the layer A in a suitable covering, it may be secured to the layer B in any manner which will retain the fibres. The layer A is designed as a cushioning layer and is placed in the inner side of the fabric or the side opposite that against which the projectile strikes.

The second layer B, or that against which the projectile strikes, is composed of one or more thicknesses of relatively large strands or cords b, of strong material, each composed of a number of fibres spun or wrapped together, as distinguished from the layer A just described, which is composed of a mass of unwrapped fibre. These

strands of layer B instead of being arranged parallel with each other and secured together by stitching, are woven or braided together in such manner as to form a continuous and compact fabric. The particular style of weaving or braiding layer B is not essential; but any arrangement may be employed by which the strands forming the same will be brought very compactly together and will be held closely upon each other by their woven or braided construction, as distinguished from stitching and like securing means.

The cords or strands constituting the layer B are tightly twisted to form hard, compact strands and are laid closely upon each other in the process

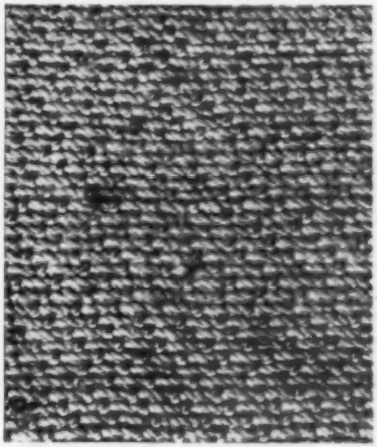


FIG. 4. ½ IN. THICK.

of weaving or braiding, so as to present a hard, unyielding surface, against which the projectile strikes. Such construction also gives great lateral rigidity to the fabric and insures against the displacement of the strands.

In practice it has been found that both layers A and B are best constructed of silk, which, owing to its strength, and doubtless to the peculiar characteristics of silk, furnishes the most satisfactory results. The number and thickness of the layers B will be regulated in accordance with the use to which the fabric is to be put, it being obvious that a heavier or a greater number of layers, such as is shown in Fig. 2, will be required for heavier than lighter classes of arms.

In practice the layer A will usually be made of a thickness equal to about twice the thickness of the layer B; but this proportion will depend upon the use to which the fabric is to be put. It being the purpose of the layer A to cushion the impact of the projectile, it follows that for the larger projectile a thicker layer will be required. The thickness of layer B may be increased by making the strands b of greater diameter or by making this portion of the fabric of two or more separate layers, as shown in Fig. 2. The layers A and B may be secured together in any convenient manner, as by stitching or otherwise.

Congress for Unifying Thread Numbering.

On account of the international importance to the textile industry of the questions to be discussed by the congress of thread numbering of 1900, the organizing committee has addressed a special circular to French manufacturers, to explain the present state of the case.

It is understood from the start that the congress will confirm the principle already adopted of applying, where possible, the metric system, taking the kilogram as the unit of weight and the kilometre as the unit of length. The movement in favor of applying this standard exclusivey already exists in the United States and is gaining ground in England, the only two countries which still hold to their own peculiar measures. But, even in French industry, for trade reasons which have never been changed, the English system of numbering is in use for linen goods. The manufacturers of tulle in Calais and Saint-Quentin, with a view to their English market, keep to the same method. In the woolen manufacture, methods are still more diverse, according to the kind of weaving and the locality.

Four international congresses were

successively held, at Vienna in 1873, at Brussels in 1874, at Turin in 1875, and at Paris in 1878, with a view to the general adoption of the metre and the gram as bases of universal numbering of textile threads. The resolutions adopted received only a partial sanction, and the Exposition of 1900 seems to offer a favorable opportunity for taking up the question again and bringing it to an issue.

Before calling together the manufacturers of other countries, it is thought necessary by the organizing committee that French manufacturers should have before their eyes the state of the question, the resolutions which have already been adopted, and the resistance which has until now prevented the carrying out of a reform so much to be desired. For this purpose a communication presented to the Society for the Encouragement of National Industry, shortly after the last congress, in March, 1879, by one of the secretaries of the committee, M. Edouard Simon, gives information that is equally useful at present. Manufacturers are requested, after due consideration, to inform the committee whether they urge unreservedly the "kilogrammetric numbering" which gives the number of kilometres of thread contained in a kilogram, for all textile material other than silk—the numbering of silk, on the other hand, indicating the weight in grams of a myriametre of thread. The reasons against the adoption of these bases are asked, so that French spinners and weavers may come to an agreement among themselves before inviting those of other countries to adopt the proposed reform. The program of the congress is to be drawn up in accordance with this consultation of manufacturing interests, in order that its work may have a greater result.

M. Simon's report is as follows:

The adoption of our metric system of weights and measures by a great number of manufacturing countries and the growth of international relations, render timely the unifying of the numbering of thread which is based on the use of the metre and the gram.

To number or fix the standard of a thread is to ascertain the relation between the length and the weight of the thread.

All the methods of numbering may be brought under two sub-divisions, according as the length varies for an invariable weight, or as the weight changes for a fixed length.

By the first method, the number always increases with the fineness of the thread; by the second the number increases or decreases in proportion with the standard according as the scale is ascending or descending.

The congress of Vienna nearly compromised the reform aimed at by its promoters, by not taking account of the two bases admissible in the different industries; the fixed weight, and the invariable length. The silk trade was on the point of having nothing to do with the proposed unification.

The Brussels congress, presided over, like those which succeeded it, by M. Pacher von Theinburg of Vienna, had the merit of reconciling the special conditions of silk production with the exact date of metric numbering. The spinning of silk is effected according to a method which is the inverse of the processes used for the transformation of other textile materials. Hence it is natural to keep to a mode of numbering which is also the inverse. Moreover, on account of the fineness of the staple, it is not possible to take the kilogram as the unit of weight. It has therefore been decided that, in reckoning the standard of silk, the numbers 1, 2, 3 . . . shall indicate that the myriametre taken as unit of length weighs 1, 2, 3 . . . grams.

Other textiles, without exception, keep to the numbering according to the number of kilometres contained in the kilogram. Thus, No. 150, for example, represents 150 kilometres of thread for every 1000 grams of material.

While changing nothing in these conclusions, the Turin congress

brought forward a new element of success in the unification of thread numbering, by a serious study of the conditions.

It is not always sufficient to wind off carefully one or more skeins and to ascertain their weight in order to know the real standard of the thread. The hygrometric properties of textile fibres are the occasion of differences, for a greater or less amount, which sometimes interfere with exact trade when the samples have not been previously brought to absolute dryness and then reduced to a fixed degree of humidity by the addition of the legal rate of reprise. These rates, which vary according to the nature and state of the raw material, were decided on by common agreement and recommended by the congress of Turin.

The congress of Paris went a step further and without exacting this conditioning for every operation of numbering, decided that conditioning should be made obligatory at the demand of one of the parties.

All these questions, clearly stated, were treated in successive sessions by competent manufacturers and dealers; the resolutions were voted unanimously by the members present; and yet, private enterprise has declared itself powerless. The last congress asked for the support of the governments in order to reach a solution in conformity with the bases it had laid down.

Now that the public authorities are called on to interfere, it is of use to investigate the difficulties in the way of the application of a system, which each one separately desires to see put in practice. For this purpose let us briefly review the chief modes of reckoning the standard in France.

The mechanical spinning of cotton, which is one of the most modern specialties and consequently one of those least hampered by antique customs, takes the standard number from the number of kilometres contained in 500 grams. The half-kilogram was, at the beginning, thus substituted for the kilogram on account of a certain opposition arising from the use of the pound; but it might easily be replaced now by the kilogram, since without changing the testing apparatus, it would be sufficient to double the number given by the test.

Along side of this legal numbering there is another used in the trade of fine-spun threads, not on account of any advantage over the previous method, but because a certain number of weavers were familiar with English products at a time when Great Britain spun almost exclusively the high numbers, and they have retained the English habit of reckoning. Here the metre is necessarily replaced by the yard, the half-kilogram by the English pound; and the French manufacturers who sell the product of their spindles in competition with their neighbors have been led by the character of their customers to make out their bills in both English and French numbers. This double reckoning is an occasion of errors and makes the use of tables of precise equivalents a necessity.

In the linen trade, the influence of the English market is absolute and the metric numbering is conspicuous by its absence. Among French spinners, the winding off is done in skeins (echevettes) of 300 yards, 12 skeins forming a hank (echeveau), and 100 hanks a packet. The packet represents a length of 329,000 metres nearly and the weight varies in inverse ratio with the standard number—No. 1 weighing 540 kilograms, No. 2 half as much, No. 3 a third, and so on.

Hemp spinning, according to the destination of the product, used the English numbering of linen or the kilogrametric reckoning.

For woolen, the adoption of the uniform rules proposed by the Paris congress seems relatively easy. It is true that Norman spinners still count by pounds of 3,600 metres divisible into four quarters of 900 metres, with submultiples (sons) of 90 metres. Also in the east of France and at Paris itself, there is a reckoning by skeins of 700 or 710 metres. But there are numerous establishments which unite spinning and weaving, notably at Rheims,

where the kilogrametric reckoning is used exclusively.

In all that concerns silk, France and Italy have so far kept to the reckoning based on the weight in deniers of the skein measuring 400 aunes (elles); but "denier" and "aune" vary with different regions, and there can be no reasonable opposition to substituting for them the gram and metre.

The spinning of silk waste follows the legal numbering of cotton.

According to this, all the difficulties result either from local uses which have no appreciable effect beyond a limited circle, or differing systems of weights and measures which react from nation to nation on commercial relations. In the first case, official regulations, peculiar to each country, would put an end to the anomaly and with the aid of chambers of commerce and industrial companies make individual efforts efficient. Left to itself, individual enterprise is unable to triumph over the spirit of routine; and at the times there might be unjust suspicions, if unification demanded changes in the list of prices used for designers, contractors and workers.

In the second case, the opposition of the British government to the adoption of the metric system would make the solution of the question difficult. But, according to declarations made to the Congress of Paris by English members, the trade in Great Britain is well disposed to use the metric weights and measures, which have already made their way among them in certain lines.

The president of the organizing committee of the congress of 1900, is M. Widmer, vice-president of the Association of French Industry and Agriculture. Correspondence should be addressed to the secretary general, M. Paul, gerant do Comptoir de l'Industrie Liniere, 9 rue d'Uzes, Paris.

—Congress, during the Revolution of 1776, was frequently compelled to appeal to the people to increase their supplies of wool and other materials, and to promote the manufacture of cloth for the protection of their ragged defenders in the field.

First Woolen Mill in China.

In our last April issue we gave illustrations and a description of an American woolen mill located at Tientsin, China, all the machinery in which is of American manufacture.

Under date of August 25th, the United States consul at Tientsin writes us in relation to this manufacturing enterprise as follows:

There was long delay in receiving the machinery. The vessel on which it was shipped suffered a collision and the machinery was badly damaged. However, under the supervision of two genuine American machinists, work of setting up has progressed fairly well. Most of the breaks being repaired, the mill will be ready for operation within another two months.

The size of the building is: Main, 64 by 86, part one and part two stories high, with a three-story tower.

The picking room attached is 46 by 60 feet in size. The boiler, engine and motor room is detached.

Up to this time no manufacturing institution of this kind has been a success, but it is confidently expected that this effort will prove the exception.

The manager, Wu Jim Pah, is a man of wonderful energy and public spirit and his pride in the enterprise will accomplish the desired end. The mill is amply fitted for the manufacture of fine woolen goods, but for the present will be devoted to making flannels and blankets, for which there is an unlimited market. The surplus yarn will be sold to parties owning hand looms throughout the country.

Wool is comparatively cheap. Coal is not dear and Chinese help a drug. Common labor is rarely paid over 20 cents Mexican or 10 cents gold, per day, and oftener receives less.

Most wool is very coarse, but some grades coming from Tibet are equal almost to our fine Merino wool, though it is claimed that there is not a Merino sheep in China.

R. E. Difenderfer of Philadelphia is to be congratulated on his success

in introducing this enterprise in China, considering that the German and British manufacturers did everything in their power to prevent his success, with the hope of supplying the machinery from their own country.

The Sturtevant Exhaust Head.

As indicated by the illustration, this Exhaust Head, built by the B. F. Sturtevant Co., Boston, Mass., is designed to separate by the utilization of centrifugal force. The head is attached directly to the end of the exhaust pipe from which the steam passes up to the branch pipes and is discharged tangentially within the case. It is thus given a vigorous whirling motion and the entrained water, likewise the oil, is thrown outward with great force, strikes the cool sides and trickles down to the outlet at the bottom. The

steam now perfectly dry, finds ready escape through the central opening above. As water weighs nearly 1600 times as much as exhaust steam, and as centrifugal force is proportional to the weights of the bodies in motion, it is evident that the force acting upon the water is nearly 1600 times that exerted upon the steam, and that the action is both positive and absolute.

These heads are built in sizes to fit pipes from one to twenty inches, all sizes above ten inches being flanged. The case and pipes are of heavy galvanized iron, sixteen to twenty gauge, according to size, all external joints are riveted and soldered, and the internal pipes are double braced.

Striping Attachment for Knitting Machines.

Our attention has recently been called to an improved striping attachment for knitting machines, applied more particularly to straight knitting machines of ordinary construction, the attachment having the capacity of working two, three or more yarns, as may be desired. According to this device, a number of independent yarn-carriers are provided, there being as many as may be desired, and a repository or stationary receptacle is provided for holding them. The reciprocating draw-bar or equivalent traveling device, termed the "traveler," by which the yarn is carried back and forth and delivered to the needles, is provided with a number of engaging devices for engaging yarn-carriers, there being as many engaging devices as there are yarn-carriers, and means are provided whereby any one of the yarn-carriers may be taken from its holder or receptacle by the traveler and while held by one of the engaging devices thereof will be moved to deliver the yarn to the needles. The means provided for thus controlling the yarn-carriers consists of a locking device for the yarn-carriers and a pattern-chain controlling the position of said locking device. The locking device is constructed and arranged to engage and hold all but one of said yarn-carriers in a position of rest in the receptacle provided for them, and the yarn-carrier which is not thus held may be withdrawn by one of the engaging devices on the traveler, and the pattern-chain is constructed and arranged to automatically operate the locking device, whereby the different yarn-carriers may be disengaged at predetermined times. Means are provided for operating the engaging devices on the traveler to disengage or release any yarn-carrier that may be

held by it and also to engage any other yarn-carrier and withdraw it from its holder.

Dyeing Khaki.

In an editorial on "khaki cloth," that appeared in our last month's issue, we referred to certain patents owned by Reid & Thorp, residents of Great Britain, both of whom have been in this country of late looking after their interests connected with their patent rights for dyeing vegetable fibres, yarns and fabrics, the principal object of which being to obtain certain fast and permanent colors known as khaki shades. As this matter is of evident interest to a large number of our readers, we will state that the first United States patents were obtained by these parties October 11, 1898. They have quite recently taken out additional patents, in order to cover certain improvements and modifications in their methods.

In the former patent a process was described consisting in first scouring the fibrous materials to free them from all impurities, then drying, and when dry running them through a bath of olein-oil and water. Since then it has been found that this bath is not necessary and that the process can be simplified and cheapened by omitting this step.

In carrying the present improvement into effect the fibrous materials are first scoured to free them from all impurities, then dryed and afterward impregnated with the following dye liquor: twenty gallons of a solution of acetate of chromium, (20° Twaddell), twenty gallons of a solution of acetate of iron, (12° Twaddell), and eight ounces of alizarine-blue S dissolved in four gallons of a solution of bisulfite of soda or potash, (54° Twaddell). When thoroughly impregnated with this liquor, the fibrous materials are mangled and then dried. The fibrous materials are then steamed for about an hour at, say, a steam pressure of four pounds to the square inch, and the color subsequently developed and fixed by passing the fibrous materials through an alkaline bath composed, say, of sixteen gallons of water, eight pounds of common soda, and three gallons of lime-water. By preference the fibrous materials are then soaped and finally washed and dried. For full or dark shades the above process may be repeated as often as required and the proportions varied for different shades as required.

In place of the alizarine-blue S, ordinary alizarine-blue, gallein, cerulein, or like product of anthracene might be employed, and in place of the acetates any other suitable salts of chromium and iron could be used.

New Worsted Spindle Oiler.

The illustration shows the No. 2 oiler recently designed and being put on the market by Bamford & Smith of Pascoag, R. I., manufacturers of the Bamford dust-proof and self-lubricating spindle tube, which has been so widely adopted by worsted manufacturers.

Their No. 2 oiler is designed to supply a recognized need for such a device. The claims made for it are important and command attention from those seeking economical results and high grade production. Among them are the following:

It keeps the spindle thoroughly oiled for three days with one oiling.

It is practically indestructible, being simple in construction and should last indefinitely.

It effectually prevents dust and lint from clogging the tube, thereby wearing out the tube and worse than that, retarding its speed, which results in making imperfect yarn.

It will be noted in the cut that there is a felt washer, which sets upon the rail and the washer rests upon that.

The saving in oil is also an important consideration. It has been stated by an old worsted spinner that 80 per cent. of the oil put on the spindles usually is thrown on the floor or into the yarn. By holding one's hand near the base of the whorl after oiling, the doubter may easily be convinced that there is a great deal of oil being thrown off.

The manufacturers believe that a trial of the oiler will convince worsted spinners of its efficacy, and offer to send a frame on approval with the privilege of 30 days' trial, or they will send a sample oiler, with quotations on the price, which has been fixed at a very reasonable figure.

A Weaving School.

UNDER THE AUSPICES OF THE LAWRENCE LOOM FIXERS' ASS'N.

In August, 1898, the Lawrence Loom Fixers' Association, Lawrence, Mass., leased the ground floor of the Rankins' Building, 19 Oxford street, for the purpose of starting a weaving school, with the further object of laying the foundation for a textile school for the city of Lawrence. The weave room is 40 feet by 50 feet, and at present the association has six looms, which have been given to it; one by the Arlington Mills; one by the Pacific Mills; one by the Whitin Machine Works; one by the Draper Company; one by the Crompton & Knowles Loom Works; and one by Mr. Hardy, an overseer in the Arlington Mills. The looms are operated by a three H. P. motor, which is rented of the Lawrence Electric Company. The school has also a dressing frame and a large working bench, and has just received an English jacquard, which has been attached to a Crompton & Knowles pick-and-pick loom. The belting has been given to the school by the Leland Belting Company; shuttles by the Union Shuttle Company; pulleys by the J. W. Barlow Company; lease rods by the Pemberton Corporation; and warp and filling by the Atlantic Corporation. A test reel and scales, and a glass cabinet for the same, have been given by the mayor of Lawrence. Small donations of money have been received from various persons. The room which the school occupies is furnished with 100 chairs and eight tables.

Not as much interest has been taken in this school as its object merits. The school will be open this fall and winter to all who wish to learn the art of weaving, designing and textile calculations.

The purposes of this school should be encouraged by the local authorities, and especially by the officials of the textile corporations. They must be looked upon as meritorious and tending to an improvement of those who work in the mills, and as giving to them an essential training for a higher and more perfect skill in manufacture.

(Special to the Textile World.)

Textile Industry in Germany.

When American manufacturers of textile machinery are reminded that England sells Germany an average of $5,000,000 worth of textile machinery annually it must appear to them that here is a market they themselves should share in. Seeing that certain kinds of American machinery are successfully competing in England against English appliances, it is remarkable that American made textile machinery cannot compete, or, at the least, is not competing, in Germany with English machinery. It is not surprising to find Switzerland selling 40 per cent. of her total production of textile machinery in Germany. The little republic exported in all $1,445,000 of this class of goods in 1897; and such other near neighbors as Austria, France and Belgium supplying some of the German requirements, but that the United States, with its admitted superiority in the creation and manufacture of industrial machinery, should be unable to obtain some of the business that goes to England suggests either indifference or lack of enterprise on the part of its manufacturers. Or it may arise from a conviction that the

British position in the textile machinery trade in foreign countries is unassailable; an erroneous view, proven by the comparative ease with which American machinery of other kinds has superseded English equipments in lines in which England was long admitted to lead. What Americans have successfully accomplished with one class of machinery, they should be able to do with another. It will be to the purpose to glance at the condition of the textile industry in Germany in order that the importance of this market may be understood.

The German textile industry occupies, judged by the number of persons engaged in it, the foremost place among the industries of the Empire. Judged by its consumption of raw materials, Germany ranks among the largest producers of textiles in the world. According to the census of 1896 there were 945,191 persons employed in the industry, an increase of 95,332 during the 14 years from 1882. This relatively small increase in the number of hands employed compared with the development of the industry during the period is explained by the supersession of manual labor by mechanism. The value of the textiles exported from Germany during 1898 amounted to no less than $205,000,000.

The growth of the German cotton industry may be seen from the following table, showing the number of cotton spindles in use in these years:

	1887.	1892.	1898.
Alsace	1,375,000	1,400,000	1,592,848
Baden	398,172	388,384	429,786
Wurtemberg	354,548	485,185	545 271
Bavaria	924,312	1,146,636	1,390,558
Saxony	541,122	734,217	1,101,662
Prussia	984,194	1,344,666	2,030,377
Oldenburg	17,000	21,000	20,000
Total	4,594,348	5,461,288	7,115,509

The importations or raw cotton, which amounted to 10,000 tons in 1840, rose to 71,000 tons in 1890 and reached a total of 331,711 tons, valued at nearly $60,000,000, in 1898. The chief manufacturing centres of cotton goods are: Upper Alsace (Mulhausen, Gebweiler, Thann, Munster, Wesserling), Saxony (Chemnitz and district, especially the valleys of the Zschopau, Hoha and Mulde), Rhenish Prussia (M. Gladbach, Dulken, Barmen-Elberfeld), Wurtemberg (Reutlingen and district), Bavaria (Augsburg).

Turning to the woolen industry we find that in 1860 the raw wool spun in Germany amounted to 41,430 tons, increasing in 1898 to 198,479 tons. The number of wool spindles was in 1861, 1,669,759; in 1875, 2,787,373; and in 1898, 4,004,630.

In 1840 Germany led Europe in the production of raw wool, and was far behind England and France in the various branches of its manufacture. Today Germany is distancing her old competitors in not only supplying her consumption with manufactured goods, but reaching out into the world's markets, sends millions of dollars' worth of woolen manufactures from her great centres to India, China, Africa, Australia and South America. The woolen industry centers chiefly in Rhenish Prussia, Saxony, Wurtemberg and Upper Alsace. Far-famed for fine cloth are the cities of Cottbus, Forst, Sorau, Sommerfeld, Aachen (Aix-la-Chapelle). Carded yarn is made in Chemnitz, Glauchau, Crimmitschau, Plauen, Gera, Posneck, Mulhausen (Alsace). Woolen knit goods are made chiefly in Chemnitz, Apolda, Zeulenroda and in some districts of Wurtemberg.

Great progress has also been made in the silk industry in Germany. Today Krefeld can very well compete with Zurich, Lyons and Milan and the industry flourishes in Barmen-Elberfeld, Berlin and Aachen (Aix-la-Chapelle). In the manufacture of carpets and tapestry the Germans have long excelled.

According to the 1896 census the stock companies engaged in the German textile industry were as follows:

		Capital.
102	cotton spinning and weaving mills	$51,551,190
28	worsted yarn spinning and weaving mills	19,207,100
20	jute spinning and weaving mills	11,000,430
22	flax spinning and weaving mills	9,168,330
21	woolen mills	7,987,250
14	sewing thread factories	6,650,410
20	dye, bleaching, starching and finishing works	5,621,970
7	wool washing and combing works	8,545,750

10 special works (silk, carpets, etc.)	5,370,875
7 felt factories	2,333,750
5 lace and curtain factories	1,615,500
7 cloth factories	1,554,120

Giant strides as the industry has taken in recent years, it shows no sign of lessening its pace. News comes from Germany that the number of works is increasing; that the capacity of existing mills is being enlarged, and that improvements in methods are being made. A new woolen weaving and spinning mill is being erected at Mulhausen and at Dornach. The Actien-Gesellschaft Rothes Meer, with a capital of 2,000,000 marks, is building new cotton mills. One Philipp Frank of Schlitz, Hessen, is about to build wool and cotton weaving mills and a Mr. Huesker is planning a similar establishment at Reichenbach in Schlesien. These are but a few of the new plants that are projected or being built throughout the Empire.

The point is, whether the American maker of textile machinery cannot secure some share of the German business; whether he cannot compete with the British and Swiss, and the German manufacturers themselves. American machinery enjoys the very best reputation abroad. Agricultural machines, machine tools and many other special machines are being exported from the United States in yearly increasing quantities, and our largest shipments go to the heart of the great European manufacturing centers. There is absolutely no insurmountable reason why we should not be able to sell textile machinery in Europe. The opening stages of such a business may be somewhat expensive, and results not immediately commensurate with the efforts made and the expenditure evolved; but the ultimate reward will be well worth the seeking. The success already attained on the German market with American knitting, buttonhole sewing and similar machines should induce our manufacturers more closely to cultivate the German market.

The appointment of a general agent, already known to the trade, and the placing of a small stock of goods somewhere in Germany by opening a sample exposition, are measures that commend themselves. For this purpose Berlin would be the most suitable place, as this city is visited from all parts of Germany and by buyers of all kinds. Most of the textile mills have their agent, or branch, or depot, in Berlin, and there is scarcely a manufacturer who does not go to Berlin at least once or twice a year. There are importers and dealers of standing in the various centers who could be induced to interest themselves in the introduction of American goods.

All printed matter should be sent out in German. Extensive distribution of catalogues (illustrated, if possible) among the various mills would be a judicious step. Regarding payment for textile machinery the ruling terms are as follows: One-third of the amount to accompany order, one-third upon delivery of bill of lading and one-third upon delivery of goods. With old customers or firms well known to the seller the following terms are sometimes agreed upon: One-half upon delivery of bill of lading and one-half upon delivery of goods.

Machines and parts pay import duty according to the material which predominates in their composition, as follows:

Machines mostly of wood, 3 marks, or 71.4 cents per 100 kg. or 220 pounds.

Machines mostly of cast iron, 3 marks, or 71.4 cents per 100 kg. or 220 pounds.

Machines mostly of malleable iron, 5 marks, or $1.19 per 100 kg. or 220 pounds.

Cotton spinning machinery imported "knocked down" from favored nations will be classified according to the kind of iron which predominates in the complete machine, if all parts of the latter are shipped together.

These rates are levied on the gross weight.

Carding machinery, 36 marks, or $8.57, per 100 kg. or 220 pounds.

Carding machines or parts thereof containing the clothing, weighing each at least 200 kg., or 440 pounds net, imported from favored nations, 18 marks, or $4.28 per 100 kg. or 220 pounds.

Benzo Purpurine.

Reflecting on the state of cotton dyeing about 16 years ago we observe what a great change has passed over this branch of dyeing and the great difference prevailing at the present day. At that time there were very few dyestuffs having a direct relation to the cotton fibre as e. g., Anotto, Bismarck Brown, etc. With the exception of indigo, which had first to be brought into a reduced form in order to employ it for cotton dyeing, there existed at that time two principal methods for cotton, namely: the cotton had either first to be mordanted with the acetates of alumina or iron dyeing with colors or wood extracts fixing on a mordant, or the cotton was first prepared with tannin and then dyed with basic colors such as Magenta, Methyl Violet, Methyl Green, etc.

On the appearance of the Benzidine colors a new epoch opened which entirely altered the former methods of cotton dyeing.

The first of this extensive range of colors which appeared on the market was Congo Red, a substantive benzidine dyestuff dyeing cotton direct in an alkaline boiling soap bath without any mordant, producing a red as fine in shade as Turkey red, but unfortunately its fastness to light and acids was inferior to the latter. In the same year Chrysamine followed, a benzidine dyestuff dyeing cotton direct a fine yellow in a boiling soap bath without any mordant. Chrysamine being very fast to light supplanted Anotto in a very short time, and has steadily increased in favor, and even now finds employment in cases where its susceptibility to free alkalies is not taken into consideration.

The discovery of the Benzo Purpurines in 1885 was a considerable progress in the branch of substantive dyestuffs.

This class of red benzidine dyestuffs, dyeing cotton direct, owing to their uniqueness and peculiarity caused an entire revolution in the method of dyeing. They further formed the foundation of the vast and so important group of benzidine colors, without which a great void would now be felt.

Benzo Purpurine appears on the market in four different qualities, 1 B, 4 B, 6 B and 10 B. To this class of red benzidine dyestuff can further be included such products as Delta Purpurine 5 B and 7 B, together with Congo and Brilliant Congo R and Brilliant Purpurine R which likewise enjoy a certain amount of favor.

The benzo and delta purpurines are especially adapted for the dyeing of loose cotton, of ordinary and mercerized cotton yarns (which are afterwards especially employed for weaving tickings) for the dyeing of ordinary and mercerized cotton piece goods, flannelette and velveteen. The benzo and delta purpurines, etc., when dyed on wool as well as wool yarn are marked by their extreme fastness to milling: they also find employment in the dyeing of wool flannels, half wool yarn, half wool felt, half wool trimmings, half wool material: for dyeing silk pieces as well as yarn, half silk pieces, jute yarn, linen pieces, in the manufacture of blotting paper (particularly 1 B and 10 B marks), etc.

In printing the benzo purpurines are used for dyeing half silk pieces which are to be discharged white with zinc powder, further for slubbing printing, for dyeing half wool pieces to be color discharged, etc.

They are also very much employed for printing flannelette in either plain shades or in patterns to be cover-printed with aniline black or on material which has to be discharged white or colored with acetate of tin.—Pamphlet Farbenfabriken of Elberfeld Co.

—Recent publications have indicated that the Scotch wool manufacture, and particularly the tweed branch, has gone to pieces, and that large quantities of machinery have become idle in its chief centers, much of it permanently.

Mexico and the Metric System.

Mexico is to be congratulated for having at last succeeded in introducing the international metric system throughout her extensive territory (767,305 square miles), and among a population of 12,000,000. As early as 1857, Mexico legalized metric weights and measures, but political revolutions and other obstacles delayed for over forty years its definite adoption. With the advent of settled political conditions under President Porfirio Diaz, the government began to generalize the knowledge of the system. In the federal public schools, instruction in the metric weights and measures and their equivalents, was made compulsory, and soon extended to all schools, public and private, throughout the Mexican union. Ten thousand collections of metric chromolithographic charts were sent to the several state governors, who distributed them to all the public schools. To facilitate matters, a department of weights and measures was created, the purpose of which was to acquire and preserve exact standards of the fundamental metric units, and to test the accuracy of those used by states, municipalities, corporations and individuals. Besides acquiring perfect models, in platinum and iridium, of the metre and kilogram recommended by the international metric convention, the department procured thirty fine collections, each composed of a metre, kilogram and litre.

Although the 8th of September, 1892, had been set for the legal adoption of the system, it was necessary to extend the time until January 1, 1896. In the interval, a number of obstacles presented themselves, the chief of these being the impossibility of manufacturing in the country a sufficient supply of weights and measures. To meet this want, the municipalities of the republic were empowered to purchase standard sets of metric models. The way was thus paved for officially assigning the 16th of September, 1896, as the day on which the international metric system only should be legal in the Mexican union.

Mexico's successful inauguration of this highly scientific metric system is due to the minute and comprehensive measures taken to disseminate a thorough knowledge of it to the remotest corners of her territory. Thanks to these steps, a population greater than that of Canada are now using metric standards in their daily commercial and industrial transactions. The Mexican people have readily learned to adapt themselves to the new conditions, and have been materially aided by the extensive distribution of comparative tables for the conversion of the units of the old system into those of the decimal metric.

F. M. Noa.

—C. P. Austin, Chief of the Bureau of Statistics, Treasury Department, Washington, in his late annual report, has a very lengthy article on American Commerce, with map, which the American people ought to carefully read, as containing much of value in the way of facts, etc. Mr. Austin thinks, which figures would seem to substantiate, that the United States has not made that satisfactory progress in its commerce with the South American States, or has taken advantage of its opportunities as it should. It is to be hoped that the evidences that are to be seen at the export exposition, now being held at Philadelphia, will bring to our business men a realization of the advisability of looking into the wants of the South American people, to see if our domestic manufactures cannot be so directed as to meet their ideas and foibles. This applies with particular force to the manufacture of cotton goods, clothing, machinery, iron and steel, mineral oils, flour, provisions, and other merchandise of this character, lines in which we are not only successful, but in which we are proving ourselves able to compete with the greatest and most experienced manufacturers and producers of the world.

The Gobelins Tapestry Manufactory of the French Government.

LOUIS TURGAN.

To this time-honored institution the word "manufactory" is applicable in its strict literal sense, for the "artistes tapissiers" have raised their art to such a pitch that no engine or machine can in this case be substituted for hand work, as it has been nearly everywhere else; and the only pre-occupations of those who weave the precious fabrics are a love of the beautiful and a desire to attain the highest perfection.

In the East, from very remote times, fabrics were woven by a loom with vertical weft; and it is said that the Egyptians were the first to place the loom and weft in a horizontal position, for facilitating the manufacture of ordinary tissues, this latter arrangement having received the name of "metier de basse lisse," in opposition to that of "haute lisse," which is found at the Gobelins in its definite form.

According to Pierre du Pont, "maitre tapissier" to Henri IV., the manufacture of tapestry began to be known in Europe about the 8th century, when some of the Saracens who had invaded the south of Europe introduced the carpet manufacture into France. Both carpets and tapestry were produced by private enterprise until the time of Francois I., who brought together the most skilful weavers he could find, and established them at Fontainebleau, under the direction of Salomon de Labaines, the King's weaver. Henri II., while maintaining the establishment at Fontainebleau under the direction of Philibert de Lorme, founded a new one in the Hopital de la Trinite.

At the commencement of the 17th century, Henri IV. housed the weavers, Lorent and Dubourg, in the Faubourg Saint-Antoine, Paris, whence the manufacture was transferred to the galleries of the Louvre. At the same time the King brought from Flanders a party of weavers, under the direction of Marc de Commans and Francois de la Planche, who were installed in the Faubourg Saint-Marcel, in one of the houses of the Gobelin family, and near the dye works founded at the end of the 15th century by Jean Gobelin. This latter, a dyer of Rheims, had been induced to settle on the banks of the Bievre, owing to an old tradition which attributed to the water of this stream valuable qualities for dyeing scarlet; and Jean Gobelin, with his son Philibert, remained at this spot during the end of the 15th and beginning of the 16th century, as is clearly seen from a passage in Rabelais.

The sons of Commans and de la Planche separated in 1629, Raphael de la Planche establishing himself in the Faubourg Saint-Germain, while Charles Commans, and his children after him, remained in the house of the Gobelins until about 1654. A few years later, Jean Gluck, who brought from Holland a new process for dyeing scarlet, acquired the factory of the Gobelins (then occupied by a dyer named Chennevix, who had been a partner of Etienne Gobelin), so that in the middle of the 17th century the name of Gobelin was associated with both weavers and dyers.

On the other hand, the above-named Pierre du Pont, who about 1604 had invented the art of making Turkey carpets, was established under the patronage of Henri IV. in the galleries of the Louvre; and, in 1627, an ordinance of Louis XIII. granted him the manufacture of "all kinds of carpets and other works of the East, in gold, silver, silk, and wool" for 18 years. His apprentices, to the number of 100, were lodged in the Maison de la Savonnerie, at Chaillot; and in this ancient soap manufactory the first carpet looms were mounted by Lourdet, partner of Pierre du Pont. Accordingly, about 1662, while carpets were made at the Savonnerie, tapestry was produced at the Louvre and in the Faubourg Saint-Germain, the Hotel des Gobelins then no longer containing weavers but only dyers; and it is at

this period that Colbert bought the Gobelins buildings, to which were removed the old looms of La Planche and Commans, and whither were transferred the other weaveries of Paris. The Manufacture des Gobelins was thus definitely founded; and very soon this nucleus was reinforced by weavers from Mainey.

In 1694, when the war absorbed all the country's resources, the manufactory was closed; but five years afterwards work was resumed under the direction of Mansard, although only in the tapestry department. After that period, notwithstanding all the vicissitudes through which the country has passed during the last two centuries, never has there been cessation of work at the Gobelins; but during the Revolution the very existence of the manufactory was several times in danger. The workshops, which contained nearly 300 weavers under Louis XIV., only occupied 46 in 1797, the national manufactures being regarded as useless establishments, and many "chefs d'œuvre" having been destroyed at that period. The Consular Administration, however, re-established the system of apprenticeship, which had been suppressed, while also appointing a director of dyeing.

In 1825, the manufacture of carpets at the Savonnerie was suppressed; and the "basse lisse" looms of the Gobelins were sent to Beauvais, while carpet looms were put up in the vacant workshops, so that at the present day the weavers of the Gobelins manufactory produce the carpets and tapestries that are ordered entirely in looms arranged vertically. The internal organization of the Gobelins had been ingeniously arranged by Colbert, the director having under his orders the foremen (chefs d'atelier), who were at the same time contractors for the work, and fixing for each piece of work the amount to be given to the contractor, who paid his weavers. In order to ensure permanence in the colors, both wools and silks were dyed at the manufactory and handed over to the contractor, so that, the quality of the work being ensured, the weavers had an interest in producing, and the State knew beforehand the price to be paid for a piece of tapestry.

In 1792 the organization established by Colbert was suppressed; and the contractors (now become foremen) with the artists (now employees) received a fixed remuneration. This system is still in force; and the salaries have been but little increased since, although the weavers are lodged in the manufactory and receive a pension at the age of 60. Since the foundation of the Gobelins, in 1662, there have been twenty-three directors, beginning with the painter Le Brun, followed by the painter Mignard between 1690 and 1695, while M. Gerspach, who was appointed Chef de Bureau des Manufactures Nationales in 1885, was succeeded, in 1892, by M. Guiffrey, the present director, an authority in all matters connected with weaving and tapestry.

During more than two centuries the buildings of the Gobelins manufactory remained just as they were under Louis XIV.; but the formation of the Avenue des Gobelins, the great fire in 1871 (when nearly 300 tapestries of inestimable value were destroyed), and works connected with the Bievre, have partly modified their general appearance.

Visitors to the manufactory (which is opened gratuitously to the public, without formality of any kind, every Wednesday and Saturday) pass through the museum and three small galleries before entering the Atelier de Berri, which contains three looms, whence they descend into a second workshop, that has often been altered but never entirely reconstructed, where the famous Dutch weaver Jans worked in the 17th century. From this workshop, where there are now eight looms, a bridge gives access to the Atelier de la Savonnerie, where two looms suffice for the weaving of carpets, the others, now unoccupied, being veiled by admirable tapestries; and near to the Atelier de la Savonnerie is a third workshop for tapestry.

containing two looms. Inasmuch as the number of weavers is now complete, the school of tapestry is without pupils, and the drawing school has been transferred to a new building.

Pupils are admitted to the elementary drawing-school at the age of twelve, the instruction generally lasting two years; and from this obligatory course candidates are recruited for the school of tapestry. The education thus begun is completed at the Ecole Superieure and the Academy, the antique, the living model, and perspective being subjects that are ardently pursued. It is chiefly in order to furnish recruits for the ateliers that the school of tapestry was established. The teaching is graduated, the pupils being first initiated into the use of the tools, after which they are set to execute bands of flat tints, with ornaments that become more and more complicated. After a year each pupil receives a premium of $20; and, if he passes the examinations satisfactorily, he is paid a salary of $120. After about two years a good pupil is able to begin work at the Manufacture; but it is only with long years of practice that a weaver completely masters the great difficulties of his art.

The Gobelins manufactory now consists of three distinct portions—the dye works, the tapestry ateliers, and the carpet workshops.

The dye works at the Gobelins, now under the immediate management of M. Guignet, are incontestably the most important in the whole world, not on account of the quantity turned out, which scarcely exceeds 6 cwt. of wool or silk yearly, but owing to the perfection and multiplicity of the operations; and these works supply the Beauvais as well as the Gobelins manufactory.

The wool, which for a long time came from the county of Kent, is now obtained from the national domain of Rambouillet, and on arrival at the Gobelins is classified according to its destination, and then, after examination by the foreman, is subjected to a scouring process, depending upon the colors which it is intended to receive. Passed cold through lime water or a carbonate of soda solution, the wools have more or less aptitude for receiving this or that dye, according to their origin and the nature of the scouring liquid. The operation of scouring must be watched with great care, especially as regards the carbonate of soda bath, the temperature of which should not exceed 122° F. for fear of disintegrating the wool. The skeins, passed over long poles called "lissoirs," are then plunged into one of the square coppers which contain the mordant, that must be kept at boiling point, after which the wool is subjected to the color bath.

For producing, not only the many tints, but also the twenty or thirty shades of each tint, required by the manufactory, the dyers must be veritable artists; and at the Gobelins a point is made of producing colors "de grand teint," i. e., "fast," or permanent. The light shades are specially difficult to obtain; and a great many fine pieces of tapestry, that date from the commencement of the present century, are gradually losing their effect, owing to the decomposition of certain tints which have completely turned brown, while others have entirely lost their color. Each tint at the Gobelins has its scale, or series, consisting of a certain number of shades, from the lightest to the most intense; and, although the difference between one shade and another is imperceptible to the ordinary eye, dyers distinguish them, not only when dry, but even when still quite wet.

When the color is simple, the operation of dyeing is conducted in the following manner:—The bath is charged to the deepest shade of the scale, or series, desired; and the dyer, having placed on his poles the skeins which he destines for the deepest shade, immerses them in the bath, examines them, takes them out, hangs them on uprights at his right hand, re-plunges them into the bath, again examines them, determines the length of time during which he should allow them to steep, or dry; and, when he considers

that the skeins have been dyed to the desired point, he removes them and spreads them out, while, if necessary, he can again immerse them, although this must be avoided as far as possible.

During the work of the dyer the bath gradually becomes weaker, and it is renewed by degrees if required. As the impregnation of the liquid diminishes, the shades become so pale that the last appears white when compared with the first; and it is for these last shades that practised eyes and hands are required. While the wool has to be dyed strongly and deeply, the shade must be as light as desired, so that dyeing which attains this degree of perfection is a veritable art, requiring great intelligence and long experience.

(To be continued.)

New England Cotton Manufacturers' Association.

NEWLY ELECTED MEMBERS.

For active membership: Edward C. Beach, Agt. Mass. Mills in Georgia, Lindale, Georgia; James C. Chalmers, Vice-Pres. Renfrew Mfg. Co., Adams, Mass.; James T. Ferguson, Supt. Boott Mills, Lowell, Mass.; Louis B. Goodall, Treas. Goodall Worsted Co., Sanford, Maine; S. Greenwood, Mgr. Canadian Colored Cotton Mills Co., Cornwall, P. Q.; William M. Nixon, Pres. Atlanta Woolen Mills, Atlanta, Ga.; Herbert W. Owen, Asst. Supt. Merchants Mfg. Co., Fall River, Mass.; Albert R. Pierce, Supt. Pierce Mfg. Corporation, New Bedford, Mass.; J. F. Powers, Supt. Eagle Mill, North Adams, Mass.; L. B. Renfrew, Asst. Mgr. Renfrew Mfg. Co., Adams, Mass.; Henry B. Sprague, Treas. Boston Woven Hose & Rubber Co., Cambridgeport, Mass.; and F. E. Watties, Agt. Boscawen Mills, Penacook, N. H.

For associate membership: Percy H. Brundage, Commission Merchant, New York; J. E. Cheesman, Gen. Mgr. Cheesman Cotton Gin Co., 27 William St., New York; C. C. Cowan, Pres. of Cotton Exchange, Memphis, Tenn.; W. B. Hammond, Engineer A. A. Griffing Iron Co., 177 Fort Hill Sq., Boston, Mass.; Frank B. Kenney, Kitson Machine Co., Lowell, Mass.; Peleg A. Rhodes, Inspector of Cotton Mills, Providence, R. I.; John E. Searles, Pres. American Cotton Co., 27 William St., N. Y. and Lettis R. Washburn, 235 No. Water St., New Bedford, Mass.

What Must Be Done to Spin Fine Yarn on a Filling Frame.

Paper presented by Arthur H. Gulliver, Ashton, R. I., to the New England Cotton Manufacturers' Association at its Montreal Meeting

There is no question that filling yarn requires more careful attention than warp. It is more easily affected by atmospheric changes and by variations in the length of the staple. It is a final process, and has not the spooling and warping where it is possible to discover poor work before it is put into the loom. It cannot be handled under unfavorable conditions, as well as on the mule, as there is no opportunity to vary the strain on the yarn with the ease that it can be done with the fallers and the winding motion on the latter machine. This fact is recognized in the desire to obtain the best ring spinners available by paying more per side on the filling than on the warp frames and thus using a more economical class of help.

In fact the continued increase in the demand for frame spinners will make it advisable to pay even more per side to secure a permanent class of hands, that will take a personal interest in their work, and ensure better quality and larger product. If such operatives are employed a better grade of work can be expected and demanded than from the average run of spinners in the mills.

This care must be given in the whole supervision of the room from the overseer to the doffer. It would almost seem as if it should be stated the other way, as the doffer is a very important factor in the running of the filling in the loom. It is absolutely necessary

that he should start the yarn on the bobbin, so that it will weave off clean on the loom. The finer the yarn the more important his work, as the strength of the yarn will not allow any extra strain. The bobbin next claims attention; it must be kept exactly right for the spindle. If it needs reaming on the top or the base, it should be done at once, so that it will be kept in place. As the filling frame requires straight doffing, more or less waste will collect in the bobbin; this must be kept cleaned out so that the bobbins will stand in line, each in its proper place on the spindle.

Have the bobbins made as large on the top as it will pay to run, make the size three-quarters of an inch rather than five-eighths; and, after leaving coarse yarns, it is not economy to use half inch, and even on these the larger size is preferable. If it is necessary to spin a finer number than the one that is running on the frames, use the bobbin larger on top with the requisite taper, and it can be done as well or better than by changing the ring. This is a very important point in spinning fine filling with success, as the strain on the yarn is always on the small part of the bobbin. It is better to have ridges, rather than grooves, not only on account of making the bobbin stronger, but also to give the larger diameter to relieve the strain on the yarn in spinning. In using this style of bobbin there is a tendency for the yarn to slip over the ridge if the wave comes up to one at the end of the traverse, but the thread can be bound in place by running up slowly and using the quicker part of the cam on the downward course of the traverse. A short cone is better than a long one with lifts of medium height, cut hooking, so that the yarn will not slip off, and a groove cut on the bobbin between the cone and the base will make a better bobbin for weaving. The long cone decreases the length of the yarn that can be put on the bobbin, and requires more stoppage, as the frame will require to be doffed oftener. The ring should not be larger than 1⅜ inches up to number 55 yarn, from this up to 70 1¼ inches, and for finer numbers 1⅛ inches. In making a choice between two sizes of rings, should give the preference to the smaller, as not a few of the difficulties in spinning fine numbers can be overcome by the use of the smaller ring. It goes without saying that a good ring is required, one that is round, and it will be worth while to try them all and reject those that are not up to the standard.

The traveler should be as light as possible without making too soft a bobbin, and still heavy enough to keep the thread from ballooning so much as to require a separator. The latter should not be used if it can possibly be avoided as it catches a good deal of waste and adds more or less of it to the yarn, even with the best care in keeping it properly brushed. It also interferes with the proper examination of the bobbins on the frame, to see that they are all at the same height and in the proper place on the spindle. The traveler must be made with the right flange for the ring used, and as small a circle as will go on the ring without undue breakage, and it is best to use the round point traveler.

The spindle speed should be low rather than high, as frame spindles are now run. On 60 yarn 7800 to 8000 turns is a satisfactory speed, and from that to 8500 on 36 yarn, but even on this a slower speed will not be a mistake as less speed means less breakage and less twist. The matter of twist is one that gives the most trouble, as on carded stock, there must be more than the standard mule twist. It will need from one and a half to two and a half turns more on average cotton. How much only the running of the spinning will determine, as it must run well; there is no economy in running so that the quality will not be the best. On combed stock there is no question that the twist can be less than standard, and on numbers finer than 65 it will be economy to use this preparation.

The draft should not be too long. 13¼ on 36 yarn will have to be decreased on number 42 to make the

work as good, and the yarn as satisfactory. As the yarn becomes finer the draft should be gradually made less, until a draft of ten and one-half is reached for 60 yarn. If it is possible to make finer roving than this requires with the carding machinery, and still use double roving, it will improve the spinning. In spinning any number it is necessary to use double roving, as the work will not be satisfactory without it. One word more about double roving, a number of mills needing more filling yarn alter a warp frame to the filling wind, still using the single roving, but the results are not the best, and not a little of the fault found with goods made from frame filling, and the making of this filling itself, comes from just this method of spinning filling yarn. Filling yarn will need less twist with a shorter draft, and if possible to make this choice, should give the preference to one tooth less draft, rather than one more tooth of twist and the spinning will show more improvement.

The best conditions can be obtained in a room where the humidity runs from 55 to 65 per cent. and the temperature can be kept low in the extreme warm weather. This would make it advisable not to put the frames on the upper floor under the roof but on a floor below, leaving the upper by choice for the warp yarn.

The frame should be made with short boss rolls, the stands pitched to insure the twist running up to the bite of the rolls, the saddles set so as to leave the middle roll without weight, the thread guides round rather than flattened on one side, and provided with a kink arrester. There should be a traveler cleaner, and the roving trumpets should be made with as small a hole as possible. There should be plenty of space between the thread board and the top of the bobbin, and the choice should always be given to a wider rather than a narrower gauge of frame.

There will be no doubt that it is economy to select as good staple as possible for the filling yarn in mixing the cotton, as less twist is to be the goal always sought, the quality of the stock and the evenness of the staple are important considerations. A bobbin filled with yarn spun well will mean good weaving large production and a medium amount of waste which should not be any more on twelve bobbins than is usually made by the weaver in putting one cop in the shuttle. Without question, the best method of setting the twist is to keep a surplus stock of bobbins, from four days' to a week's supply, ahead of the looms and have the filling kept in a damp cellar or on a rack over running water. If this cannot be done, air moistened with water should be blown or sucked through the boxes of filling in enclosed bins. During the cold dry weather it will be advisable to heat the water from the returns from traps on the circulation pipes or from the slashers.

There has been a great increase in the spinning of frame filling within the last few years, and first one mill and then another makes finer and finer yarn. There seems to be no question up to number 80, and the results on numbers finer than 100 seem to be very satisfactory. The saving in cost of production is not the same in every case, but half a cent per pound ought to be possible on the finer numbers of yarn. This with the large saving in cop waste, the most expensive waste made in a mill, makes a strong argument for the frame and the change from mule yarn to frame yarn would seem to be a move in the right direction.

Various Systems of Computing the Costs of Manufacture.

Paper presented by James G. Hill, Lowell Mass., to the New England Cotton Manufacturers' Association at its Montreal Meeting.

The question has often been asked, is there any rule or law that governs the cost of manufacturing cloth in cotton mills? The novice naturally seeks the cost of one number of yarn by that of another already obtained, but

finds the result wide of the mark and very naturally seeks the reason.

For instance, if he has the cost of number 20 yarn, he thinks number 25 ought to cost, say, 25 per cent. more or some certain ratio of increase, whereas the cost may be but little more and is certainly less than 25 per cent. But to conclude from this reasoning there is no law governing the costs of manufacturing cloth is misleading, because we are unwilling to admit our business has no proper methods, but, on the contrary, claim it is a science and has rules that are exact. The rule or law governing the costs of yarns is, that yarns vary as the square root of the third power. But as the manufacturer makes little or no difference for a great variety of counts in the picking, carding, drawing and first process of roving, it is obvious all counts up to and including the first process of roving will cost substantially the same, but from this point on the rule holds good in the main.

We all know that in the general run of cotton mills the speed and quantity of picking, carding and drawing is fixed at a definite quantity and only change after the first roving. Theoretically a speed and quantity that is just right for number 25s is too much for 30s and too small for 20s, but as so many and constant changes would be necessary if we varied our quantity with the counts the labor and trouble would doubtless be more expensive than the injury to the yarn by over production for the finer counts or the increased cost of the coarser. Moreover the liability to mistakes in changing gears and pulleys by inexperienced operatives would again be a serious objection, for all of which reasons the custom prevails of spinning all counts in ordinary plain mills, at least, from the coarse roving.

To illustrate this point, suppose we take number 22 yarn. This number of yarn will cost in New England, say, about two cents per pound to spin, and in considering these costs only the mill costs proper are treated—no general expenses, repairs and cotton are included.

Then if the law above mentioned should be applied to number 20s the cost would be about one and four-fifths cents per pound, whereas the actual cost would be quite considerably more or about one and nine-tenths cents per pound, and inversely if finer counts are taken, and in so far as the costs of the yarns are concerned this difference is wholly on account of the methods of manufacture.

In all general rules laid down for the costs of yarns it is obvious only plain cotton mills, so called, can be considered, because in fancy weaves too many variable factors enter into the problem to permit of any uniform rule even for one such mill, much more any number. It is evident, then, that this law governing the costs of yarns cannot be applied because of our methods of manipulation, then next comes the question what method or system can be used? In all plain cotton mills the best method to adopt is to make the cost for all numbers of yarns up to and including the first process of roving by the pound and beyond that stage by the hank.

But even this method in a mill of a large variety of counts will need a very careful scrutiny or some coarse yarns will be found to cost much below the real cost while the finer yarns may be too high, but this can be corrected by a careful revision of the numbers. To illustrate this point, I have a mill in view which found itself making yarns as coarse as 6s in the same mill spinning 30s. When the costs were first made up this very coarse yarn was ridiculously low but by using proper numbers for both warp and filling the true cost was easily found and the general method retained.

It may be of interest, possibly, to note what relation the several subdivisions in the different departments bear to each other and therefore I have made the table below showing the various classes of work with the percentages opposite each. I think

such subdivisions assist in finding the true costs and also to correct any expensive departments.

Classes or Subdivisions.	Percentages.
Overseeing, etc.	15.87
Picking	1.45
Carding	4.46
Drawing	2.68
Roving and spinning	18.52
Ring cleaners	0.58
Back boys	1.65
Doffers	2.45
Spooling	3.86
Warping	1.18
Web drawing	1.51
Slashing	0.83
Weaving	44.96
	100.00

By an inspection of this table it would appear that if a mill could be built involving little or no transportation and if it was possible to make each operative do his or her full duty, quite a considerable portion of the 15.87 per cent. for general expenses could be saved, but of course all ideal mills are well enough to illustrate what might be, but as we must deal with the practical let us resume the subject under discussion.

Next, in order, is the dressing department and as the true cost varies so little from the cost if made out by the hank it is hardly worth while to complicate this method by trying to rearrange it, and we may therefore deem this system sufficient.

In the last process of weaving two methods may be adopted, the first, to make out the cost by the piece, yard or pound and secondly, by the hank. If the weaving was paid by the pound as in some few mills instead of by the cut or piece, the former would be preferable, but in the latter case where the weaving is paid by the cut the simpler method is to make the cost by the hank and thus keep one uniform system.

There is much that might be said in connection with weaving, but I fear it would only complicate the subject and become so complex as to be of little value.

To make a correct cost of goods it is evidently essential that yarns should be carefully weighed and accurate numbers affixed to each count, because without this accuracy the mill is deceiving itself.

I knew several years ago a mill that showed the smallest cost of any mill in New England and one of the officials remarked he didn't quite understand it but this mill always showed the smallest cost of any mill he knew and made the least money.

I lay special emphasis on this, because this mill had an inaccurate method of keeping the counts and so deceived themselves with the consequent loss of profit. There are many rules for finding the average numbers of yarns but the formula given below I think is the most accurate, and certainly can be proved.

But before giving the formula let us look into the meaning of hanks, numbers, etc. We number our yarns from one up, but what does this notation mean? We accept eight hundred and forty (840) yards as a hank or skein and when we find one skein weighing a pound we call it number one yarn and give numbers according to the number of skeins in a pound, which is a simple system of counting and very convenient, but I apprehend often leads us astray in getting our average numbers. For instance, number 20 yarn really means that one skein of that size weighs one-twentieth of a pound or three hundred and fifty (350) grains and instead of multiplying the total pounds by twenty we should multiply by three hundred and fifty (350) to get our hanks, which result is vastly different from the old method and particularly is this noticeable in wide variations, that is where the warp and filling are very coarse and fine.

The formula is: $N = (P + T) \div [(P \div F) + (T \div W)]$.

In this formula let N equal the average number of yarn; W equal the average number of warp; F equal the average number of filling; T equal the

threads per inch of warp; P equal the picks per inch of filling.

If any member is interested to work out this algebraical problem he will be surprised at the many factors eliminated.

As observed above the old way of getting the average number of yarn was to multiply each description of goods by its average number, add the total hanks together and divide by the total pounds.

It occurred to me many years ago that if I multiplied the several kinds by the weight of each yarn a much different result might be obtained and that proved to be the case. Later this formula was deduced from these figures.

To summarize then what has been written in this paper it will show, if we have been sufficiently clear in our statement, that the six essential factors in finding the costs of cloth, are as follows, viz.:

1st. Accurate average numbers are required.

2d. Reduce the pounds to hanks or skeins.

3d. Divide the pay-roll of the preparatory processes by the total pounds.

4th. Divide the remaining pay-roll by the total number of hanks for a constant.

5th. Multiply the average number of each grade or description of cloth by this constant.

6th. Add three and five together for your total cost.

Too much stress cannot be laid on the importance of finding accurate average numbers of yarn, especially where many kinds of cloth are made in the same mill.

In one mill I was connected with, generally spinning only one number of warp and one number of filling, the system was simple but the moment we added another kind of cloth the cost began to vary.

After considerable experience and observation I have come to the conclusion that it is impossible to get as accurate costs in a mill with a wide range of yarns as in a one count mill; but while this may be true and at times some special kind will crop out in a marked degree, on the whole this system if carefully pursued, will, for most mills with only a fair variation in numbers, give very nearly accurate costs.

In conclusion I would say that originally when I selected this topic for a paper I intended to confine the subject to the mill costs proper, but later, after a second thought, concluded to briefly touch upon the remaining items of costs.

The grand total of all costs in making cotton cloth may be divided into the three general heads, viz.:

First. Mill costs proper.

Second. General expense and repairs.

Third. Cotton.

We have already discussed the first and may now proceed to the second.

The same system may be pursued here as with the first. Divide the amount of general expense and repairs by the total hanks for a constant and then multiply this constant by the average number of each style of goods for the costs.

Third and lastly—cotton. All mills treat this item by the pound, with this difference; some mills increase the cost of cotton by the net waste while the more conservative increase the cost by the gross waste.

Group these three general divisions together and the final result is obtained.

Finally, whatever criticism may be launched at this system of making costs, I feel sure; from long experience, that if carefully pursued no mill can go far in the wrong direction but on the contrary will arrive at as correct a cost of its goods as possible under the varying circumstances.

—In earlier colonial days wool was practically the universal clothing, and the problem of how to obtain it in quantities to meet the requirements of the Puritan fathers and mothers was one which much perplexed their souls.

COTTON DEPARTMENT.

Principles of Cotton Spinning.

ROBERT CUNLEFFE.

In addition to the stop motions on the draw frame referred to in our August article, we may add that Dobson & Barlow of Boston have another method for stopping the frame when a certain length of sliver has been run into the can. At the end of the frame are two wheels, worked from the front roller, one of these wheels having one or two more teeth than the other. Both of these wheels have a pin fixed in the rim, which comes in contact with a catch, which holds up a lever. Before the lever can drop, the pins in both these wheels must push the catch off at one and the same time, when the frame will stop. According to the number of teeth in these wheels, the length of sliver put in the can is regulated. These wheels may go a number of times around, first one and then the other knocking off its catch, but no effect taking place until the two catches are both knocked off at the same time, when the frame is stopped.

We come now to deal with the electric stop motion as applied by Howard & Bullough, for effecting the same result as the mechanical arrangement referred to. We may preface our remarks by saying that the back or spoon stop motion to which we have already referred requires very careful adjustment, and to be kept well cleaned, or otherwise they will either be out of balance or stick, and thus become inoperative. And when we consider that in a frame with, say, three heads of five deliveries, and doubling six ends into one, there are ninety of these delicately balanced spoon levers, we shall see that in a card room having a large number of these frames, it is no small matter to keep them right.

The electric stop motion depends for its action on the fact that the cotton fibre is a non-conductor of electricity. The current is obtained from a small electro-magnetic machine. The first stop motion is for the sliver breaking at the back. The slivers, before they reach the drawing rollers, are made to pass between rollers which we may describe as electric rollers, the bottom one of which is fluted and revolves in bearings attached to the machine frame. The top rollers are made short so as to allow of there being one for every two slivers, which pass through the frame and revolve in plates secured to a plate which is called a back plate, which is electrically insulated from the rest of the machine, as are also the top rollers. The effect is, that the top rollers are in communication with one pole, whilst the bottom rollers are in communication with the other pole. If they touch each other the circuit is completed. This, therefore, occurs when the sliver breaks and allows them to come into contact.

At one end of the machine is the Electro-Magnet, which, when the current passes, becomes operative, and attracts a pendulum catch within the range of a revolving cam, and causes this to actuate the belt fork and stops the machine. When the cotton laps on the drawing rollers, the stoppage is obtained as follows: These drawing rollers, both top and bottom are in electrical contact with the machine frame, and, as is usual, are covered by the plates of the top clearers which are placed at short distances from them, and are attached to the insulated back plate. The top clearers, therefore, are in electric contact with one pole of the magnetic electric machine, and the drawing rollers in contact with the other. When the rollers work properly, the distance between the upper and lower rollers is of a well defined character, but should the sliver lap over either top or bottom roller, the distance between the centers increases, which raises the top roller, and so

comes in contact with the projection from the top clearer, and this produces electrical contact, stopping the machine as before.

The callender rollers are insulated from each other by much the same simple means. When the sliver is passing through they are separated, no current passing; if, however, the sliver breaks in one of the funnels, then the rollers, having nothing to keep them apart, causes contact to result. The circuit then being complete, the operation becomes suspended, because the machine is stopped until the ends are pieced up.

The last operation in connection with this ingenious mechanism, which I think appeals to us in consequence of its great simplicity, is when the front cans become full. When the required amount of sliver has accumulated in a can, the tube wheel is lifted up very slightly, which completes the circuit and stops the machine as before. It is necessary that the two parts of the machinery, which it is required to operate, should be connected one with the positive and the other with the negative parts of the electro-magnet.

It should be noticed that this is equally so for all the deliveries, there being an independent stop for each. No sooner is the circuit made by two parts of the opposite poles touching, than the current passes, and the strap is shifted. These four electric stop motions are all acquired by the mere contact of two surfaces. As to two of them, the back and front stop motions, it is absence of the cotton which causes the metallic surfaces to touch: As to the other two, the roller lap and the full can stop motion, it is the presence of too much cotton, which raises one surface in contact with its electrical opposite surface, which contact, by causing the magnet to operate instantly stops the machine.

With these different stop motions the task of the tenter becomes comparatively light, and the risk of singles, so called, almost nil.

Yet, notwithstanding these very effective motions, they require regulating and care. In the hands of a careless carder and slovenly tenter, they become worse than useless, in fact a positive evil. The tenter expects that these motions will act automatically, without her exercising any care over them, and so they will if kept in good working order, but if neglected, they cease to act, and the evils they were intended to remedy are intensified. The spoons at the back should be properly adjusted according to the weight of sliver going in, and also kept very clean, otherwise dirt accumulating, prevents the spoon acting, or from being as sensitive as it should be, causing the end to break and the frame to still keep running on. At the front, the same remarks will apply, unless these are kept oiled and clean, in order to keep them easy and free to lift when the pressure is taken from them. If these things are not attended to the evil will be greater than if there were no stop motions, because, before these motions were put on, the tenter knew it depended upon her care and watchfulness whether a quantity of singles was allowed to go, and a great amount of waste to be made. She was then ever on the alert, but now she expects these devices to prevent all this, and so depending upon them, if they do not act, the greater will be the evil.

We now come to consider the fly frames. In spinning carded yarn, the cotton, after passing the three heads of drawers, is taken in cans and placed behind the slubbing frame. The fly frames consist of slubbing, intermediate and jack frames. For very fine counts, a second jack, or roving frame, is used. We wish our readers to clearly understand that the construction of these frames is exactly identical one to the other. The only reason for using three or four different frames is to reduce the sliver from the draw frame to the proper or desired counts more gradually than would be necessary if only one or two frames were used. So that we shall have a finer hank roving in the intermediate than the slubbing, and a still finer in the jack than in the intermediate frames. The change wheels in each frame will be different in the number

of teeth, in order to get the proper draft between the rollers, and the proper twist in the roving, according to the counts passing through the frame. Just a short reference to these frames will be sufficient, and then our readers will understand that the explanations of the working parts will refer to any or all alike.

The slivers from the drawing frame are conveyed to the slubbing frame into which they are fed from the draw frame cans, one can or sliver to a spindle. In other words, no doubling takes place here.

The sliver passes through three pairs of drawing rollers. From the drawing rollers, the sliver, now called slubbing, passes to a revolving flyer carried upon a verticle spindle, by which it is twisted, and then wound upon a bobbin revolving loose upon the same spindle. The flyer runs at a constant speed, while the bobbin is driven by means of a differential motion at a speed varying according to its increasing diameter as the slubbing is wound on. And the lifting movement for raising and lowering the bobbin upon the spindle so as to wind the slubbing in regular coils, is also worked by the same differential motion.

The speed of the spindle, or flyer, is about 500 revolutions per minute, and the slubbing is delivered from the drawing roller at about 50 feet per minute, so that the number of turns per inch in this machine is .833 or 5/6th. The bobbins from the slubbing frame are next supplied in pairs to the intermediate frame, where two are doubled together by passing them through three pairs of drawing rollers, and then twisting them together by means of the flyer, and winding them on a bobbin in the same manner as the slubbing frame. This is in all essential respects a repetition of the last process, though the machine contains rather more spindles, the bobbins are smaller and the roving finer. The spindles run at about 700 or 800 revolutions per minute, and about 1¼ turns per inch are put in the roving, and the draft in the rollers about 5 to 5½.

Jack frame.—This machine next receives the bobbin from the intermediate frame, where they are again doubled, drawn and twisted as before, and this process itself is the terminal one of the preparatory stages previous to the final one of spinning. Here the strand of cotton is reduced to such proportions that, under ordinary circumstances, it can easily be drafted in the process of spinning to the required counts. The bobbins are still less than the intermediate, and the counts finer. The spindles in this machine run from 1000 to 1200 revolutions per minute, and from 2 to 4 turns per inch are put in the roving according to the hank of roving being made.

In all these frames slubbing, intermediate and jack, the spindles are driven direct from the frame shaft at a constant speed, the rollers also are driven from the same shaft, and the rate of delivery of roving is constant also. But the roving, having to be wound upon a bobbin, each layer will increase the diameter of the bobbin. Suppose for instance that the circumference of the front roller and of the bobbin be three inches, then, so long as the velocity of the bobbin over that of the spindle is the same as that of the front roller, it will take up all the material delivered by the latter. If now it be assumed that the velocity of the bobbin and rollers and the circumference of the latter remain constant, while the circumference of the bobbin be increased to 3¼ inches, it will follow, that for every 3 inches of roving delivered by the rollers, 3¼ inches can be taken up by the bobbin. As the roving is gripped by the rollers, this quantity cannot be obtained, and if such conditions arose, the roving would be ruptured. It is therefore absolutely necessary to provide some means whereby the velocity of the bobbin can be reduced, as its diameter increases, so that its surface speed shall coincide exactly with that of the rollers. This is accomplished by what is known as the differential motion, an explanation of which will be given in another article.

One or two words must now be said on a disputed point, and also explain

what is meant by bobbin or flyer leading. Most of these machines are now made for the bobbin to lead. No machines are made now with flyer leading except when specially ordered so to do. What is meant then by bobbin leading, is that the bobbin is always running faster than the spindle, and therefore winding and roving upon itself, and making it necessary for the bobbin to run slower to compensate for its increasing diameter.

A few years ago it was the rule for these frames to work with flyer leading. In that case the spindles always ran faster than the bobbin, and the flyer wound the roving upon the bobbin, and as the bobbins increased in diameter, it was necessary that they should be made to run faster, in order to keep the proper proportion of speed between the bobbin and flyer. There are some people who prefer the latter method yet.

We will give one or two reasons why the change has taken place from flyer to bobbin leading. One is, that when an end breaks in flyer leading, a small quantity of roving is unwound from the bobbin and is caught on the other bobbin near to, and a considerable quantity of waste is made. In bobbin leading such is not the case, as the bobbins winding the roving upon themselves, if an end breaks, none comes from the bobbin. Again every time the frame is started, after being stopped for any purpose, the spindles always start before the bobbin, stretching the roving somewhat, but in the case of bobbin leading, although the spindles start before the bobbin in both cases, yet in the latter, the result is just opposite; whereas in the former, the roving is slightly stretched; in the latter it is slackened just at the start, but no evil effects ensue.

We had better explain here, how it comes about that the spindles do start before the bobbin. There are two causes working together. One is there are about three times the number of wheels between the frame shaft to the bobbin, than to the spindles, and the greater the number of wheels the greater the backlash, therefore the longer the last wheel to get into operation. In addition to this, the bobbins are driven by a cone strap, the spindles or flyers being driven only by wheels, and a strap can never get into motion as quickly as the wheels. But another reason why it is better for the bobbin to lead is, that when it is empty its weight is lighter and more easily turned, when a quicker speed is required; but when it is full, its weight is greater and run at a slower speed. Just the reverse of this is the case when the flyers lead.

Colored Weft and Its Application ot Fabrics.

The manufacturers of colored goods are favored with means for obtaining their colored weft in two forms, viz., the cop and the hank. The dyeing of cops has been the study of many persons, who have experimented to no small extent with the various systems in use when in their initial stages, and have attained considerable success with the more soluble dyes, as the mere fact of the liquid having to filter through the cop gives little hope of complete success where any sediment is formed in the dyeing liquid. If the darker shade of the outer layer of dyed cops was the only objectionable feature, they could be used in broken checkings without deterioration, and might be employed in the production of the cheaper class of goods; but for goods of the more expensive build perfection of weave is desirable, and freedom from faults is essential to command a market.

The barrier to the use of dyed cops in these better cloths is the uncertainty of its behavior in the shuttle; the breakage is more frequent than by weft from pirns, and small lengths of undyed cops are woven into the cloth unawares. The manufacturers cannot examine the interior, and are to a certain extent working blindly, while with hanks imperfections can be perceived before any injury is inflicted. The more frequent unweaving of faulty places, either of undyed

yarn, double rovings, fine places, or other imperfections, which, through its encased state, are rendered imperceptible in cops, are impediments to their introduction to the more expensive goods, because of the unsightly places which are left in the cloth. The waste incurred by unweaving or remedying the bad places in the cloth, the righting of the cops when shuttling and after breakage, and the size of the cop bottoms are considerable items to be taken into account when calculating the economical use of the two systems.

The cop is a compact form and convenient for storing weft, does not entail the outlay on pirns, and dispenses with the processes of reeling and winding, but it will probably be a long time before the cop form supersedes the hank for colored weft when it is required for the best qualities of cloth, as the latter form necessitates the handling of each individual hank (when the winder is opening out the same preparatory to winding) in such manner as to make it almost incredulous that any fault in the dye, and probably in the yarn itself, should be passed without notice. Of course, much depends upon the discipline enforced, but when winders are reminded (as occasion requires) of the necessity of diligent attention, some fair results can be achieved.

The most careful attention is necessary when cloth is of one color, both in the warp and weft directions, as any unevenly dyed hanks will cause a corresponding streak in the cloth, but if the winder casts out these irregularly dyed hanks, there is a much greater likelihood of satisfactory results.

The same remarks apply to white weft, especially when it is intended for white grounds or for cloths of a delicate color. The stained or soiled hanks may be cast out, and the amount of dirt in the cloth reduced to a minimum, while the rejected hanks may probably be wound for use in a checked pattern, the broken effects of which will completely hide any imperfections of an ordinary type.

The unevenly dyed hanks which have been rejected as unsuited for the cloths composed of solid color, may be utilized in the checked cloths, as these often present opportunities for using up oddments of weft. The matting weaves will often admit of more defective weft than the plain weaves, and in a similar manner fine weft, two picks in a shed, or run on the pirn two threads together, in order to form a substitute for a coarser count, will be found to defy the detection of an ordinary observer, when two or four picks are placed together in a pattern the checking of which forms bars of white or color in addition to the double threads. The person who selects the season's range of patterns should keep an eye to the provision of one or two designs which will allow the use of weft which it might be considered inadvisable to use for some of the more susceptible designs in the range, as in many cases the designs may be considered of equal merit to others which require a distinct kind of weft for themselves. It is not suggested that inferior work should be accepted from the dyer to be used up in the manner described, but the most perfect results should be insisted upon, and even when this is obtained, some precautions of the nature indicated will be found imperative. Some dyes seem given to being irregular in depth of shade, and probably chrome green presents the worst appearance when in the hank, but the color appears to equalize itself in the cloth to a surprising extent. Indigo often tends to be somewhat irregular, and care should be taken to pick out the most perfect for designs which are liable to show defects. In addition to casting out irregular hanks, the wound pirns are often sorted into lots of slightly varying depths of shade, and afterwards used up one lot at a time to prevent the frequent divisions in the cloth caused by the use of different shades of weft.

Some manufacturers go to the extent of using two shuttles, containing the same color of weft, and put into the cloth alternately two picks from each, but this arrangement must have the weft assorted, as previously mentioned, because any great difference in the shade is likely to show in small bars; but the method to a great extent prevents great blotches of varying depths of shade from appearing in the cloth. The great blotches are bobbin lengths, or multiples of bobbin lengths, of weft of one shade woven together. One source of trouble is the state in which the weft is returned from the dyers, and often a weft, apparently even in shade, if left rough or crispy to the feel, will so rub when winding as to form an irregularity in shade.

Weft should be finished in as soft a manner as possible when used for weft, and dirty or gritty matter be thoroughly removed. Red, black, and browns very often present a sticky, or harsh finish, and are liable to glaze when winding; they are generally softened by the dyer (when intended for use as weft) by placing them in a mixture of tallow and size, which has the effect of lubricating the yarn sufficiently to prevent the winding process from interfering with its evenness of shade, and too small a quantity of grease is used to perceive any spreading or staining of the cloth when heated in the finishing process. The habit of some manufacturers to allow the winder the free use of tallow or wax is both dirty and objectionable in its results, any small lumps of grease remaining on the weft being spread over a considerable area when the cloth is subjected to a heated calender. The arrangement of the colored weft in the cloth, and the choice of the colors, depends to some extent on the colors employed for warp.

When constructing checked designs, it is usual to have patterns of varied colors across the width of the cloth, and each pattern is treated in succession, when it is often found that some of the checkings which were intended for one particular pattern form a suitable crossing for some other warp designs.— The goods intended for the home trade are not very extensive in their list of principal colorings, and a suitable mixture of the usual colorings does not require very much experience on the part of the designer who is gifted with good taste in colors, although a knowledge of the principles of coloring is very useful even in this class of the trade. Heliotrope is one of the shades for which it is difficult to find a suitable companion, except it be black, which is very accommodating, and enables numerous shades to be used, which would probably only be used very sparingly but for its aid. Black and heliotrope, or black and green, are combinations which have been very freely used of late, both alone and also in conjunction with white, when goods are produced with a white ground.

Colored weft is often finer in counts than the white or cop weft which is employed in the same quality of cloth. This arrangement holds good both in the low and the higher qualities of cloth. In the low qualities this is a matter of importance, as any difference in quantity of color in a design does not make a proportionate difference to the price of the cloth; the color, being from two to four counts finer than the white or cop, to a certain extent equalizes the expense. In the higher qualities the counts of colored weft are varied, in order to obtain certain effects in the cloth, and may be much finer to obtain fine weft lines, in which case two picks are often placed in the space of one, or coarse weft may be utilized to throw up some bold effect.—Pick, in Textile Recorder.

—De Foe boasted, in his "Plan of English Commerce," that "nothing can answer all the ends of dress but good English broadcloth, fine camblets, druggets, serges, and such like."

Eli Whitney and His Cotton Gin.

Paper read by M. F. Foster of Milford, N. H., before the Montreal meeting of the New England Cotton Manufacturers' Ass'n.

Foremost among inventors stands the name of Eli Whitney, the avowed inventor of the cotton gin. His invention has withstood the criticisms of practical manufacturers and theorists for more than a century, and it can be said that today it practically prepares the cotton crop for market, and it bids fair to be continued in use for considerable time to come unless some inventive genius can bring out something to take its place which will perform the work as speedily and cheaply and retain the staple unbroken. The manufacturer may grumble and declare that the saw gin is the most destructive process that cotton is subjected to from the cotton field to the spinning frame, yet he is compelled to accept the situation from the fact that no inventor has brought out any other process of separating the lint from the seed that finds favor with the cotton grower, for he seems to be the man to please as it is his business to raise the crop, market the same and get his pay for it.

Eli Whitney foresaw what was wanted in his day and went to work and produced it. We say he "built wisely" or that he "built better than he knew," for the test of a hundred years shows him to be an inventor worthy of appreciation. Born and educated in New England, he carried with him to Georgia that spirit of enterprise that has distinguished him among men of genius.

During the past winter the writer visited the spot where Whitney made his experiments with his cotton gin. Upon a sluggish stream that is known as Rocky Creek, which flows into the Savannah River a few miles below Augusta, Ga., stands a deserted wooden mill building with its crumbling wooden tub wheel in a decayed wheel pit. Nearby is a broken dam and a cane brake which borders upon a swamp where the long flowing moss hangs drooping from the trees. The spot is uninteresting only as a place where Whitney made experiments and operated his first cotton gin. Upon this spot the cotton growers and the manufacturers should alike join in erecting a tablet to the memory of Eli Whitney. Only for the invention of the cotton gin has cotton manufacturing assumed the vast proportions that it has throughout the world.

For the following bit of history I am indebted to Charles C. Jones, L. L. D., author of the "History of Georgia" and other historical works.

Eli Whitney was born in Westboro, Mass., Dec. 8, 1765, and after completing his education at Yale came to Georgia with the view of entering into the legal profession. He made his home with the widow of General Greene, the Revolutionary hero, and as tradition has it, had his attention directed by that lady to the subject of a machine for preparing cotton for the market. In those times the seed was laboriously and imperfectly separated from the lint by hand and Mrs. Greene seems to have foreseen that important results would follow a speedier process. Young Whitney worked out the idea and in 1793 received a patent for his famous gin. His experiments were made in and near Augusta, Ga., and about four miles south of the city is still to be seen the dam used by him to run his works. Sometimes it is said that Whitney is not the real inventor of this device, but purloined the idea from its original author, the statement being that a citizen of South Carolina constructed a gin towards the close of the eighteenth century and that Whitney surreptitiously gained access to his workshop and carried off the plan and constructing a machine, patented it as his own. This story is told with great circumstantiality and the house in which the machine was originally constructed is said to be still standing within sight of Augusta in Hamburg, S. C., on the left hand side of the road just across the Savannah River

bridge. The contemporaneous history of Whitney's times, however, shows pretty clearly that he was really the inventor. The patent was issued to him in 1793 and by act of Dec. 19, 1801 (5 statutes South Carolina, page 424) the legislature of south Carolina purchased from him the right to use his patent in that state for the sum of $50,000.00. The Augusta (Ga.) Herald of Dec. 30, 1801, mentions the passage of this act and says "In the course of the negotiations between the legislature of South Carolina and the patentee we understand that every satisfactory evidence of the originality of the invention was produced and its principles so fully explained by the ingenious inventor that little or no diversity of opinion existed as to the propriety of making a contract." Now if Whitney had really robbed a citizen of South Carolina of the invention it is hardly likely that the legislature of that very state would but eight years after have permitted him as against one of its own people to profit by the wrong. If any question was raised before the legislature of South Carolina as to Whitney's right every satisfactory evidence of the originality of the invention was produced so that there was little or no diversity of opinion as to the propriety of making the contract.

Whitney's right to the invention was further established by act of the legislature of Tennessee in 1806 by the passage of the following resolution: "Whereas it has been made to appear to the satisfaction of the general assembly that Eli Whitney, from whom this state purchased the patent right to a machine for cleaning cotton, commonly called the saw gin, is the true inventor of said machine, etc., etc."

We draw a veil over the imperfections of the saw gin and as cheerfully as the conditions justify accept the mutilated staple and rejoice that we have even that to be thankful for. But new times demand new measures and every cotton manufacturer will hail with delight the introduction of a machine which will overcome the objectionable features of the present system of ginning cotton.

The manufacturer should continue to urge upon the producer the importance of improved methods of preparing cotton for the market. Every effort made in that direction has its influence and in time will bring about the required results.

S. N. D. North.

S. N. D. North of Boston, secretary of the National Association of Wool Manufacturers, who has charge of division relating to manufactures, was connected with the tenth census, having charge of the newspapers and kindred subjects, and with the eleventh census, for which he made the analysis of all the statistics on textiles. He is a man of great force, excellent ability, and in the opinion of Carroll D. Wright, the best man in the United States for this position.

Mr. Stewart, Mr. North's chief of division, was in the tenth census in a subordinate position. In the eleventh census he rose to chief of the division of manufactures, and when that office was closed went into the department of labor as a statistical expert, where he remained until his present appointment. The Bureau of Labor Statistics has thus been a snug harbor for taking care of statistical experts whom the Government could not afford to lose in the period between one census and the next. But for some such arrangement as this it would have been impossible to get so good a staff as that which now heads the census. The right kind of talent in this peculiar work cannot be gathered at random once in ten years and then allowed to scatter as soon as the work is over, and this is one of the reasons for the establishment of the permanent census bureau.—Boston Transcript.

WOOLEN DEPARTMENT.

Ingenuity in Modern Textiles.

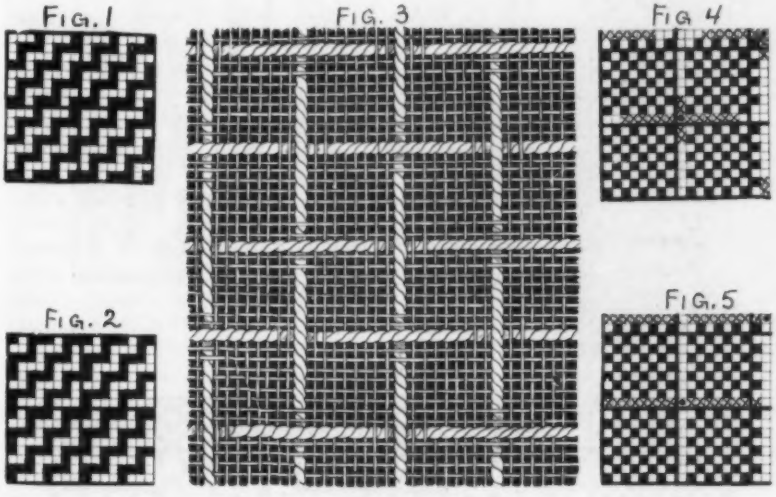
CHARLES E. WILES.

ARTICLE VII.

(Copyright.)

In treating of the more elaborate styles in connection with the subject of ladies' dress materials there is one important feature to which attention must be directed. This relates to the distinction which should necessarily be drawn between novelty produced actually during the process of weaving and that which the fabric assumes through the medium of some subsequent operation. An increasing proportion of striking present-day textures for feminine wear rely upon this latter method of decoration for their beauty, their technical construction, when analyzed as a thing apart, revealing nothing but the commonplace. To the reader who is at all acquainted with this branch of the textile trade bare mention of the foregoing fact will at once conjure up numerous instances in which this method of producing novelty has been resorted to, but for the benefit of those who may not so readily have verification of the statement one or two of the commonest examples will be quoted.

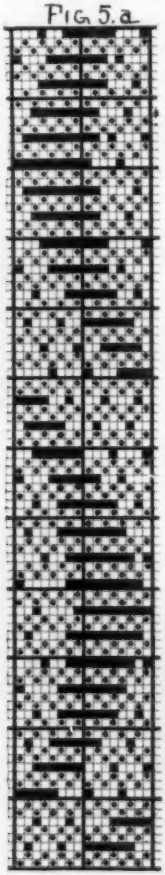
Fancy spottings are frequently an addition after the fabric has left the loom, the advantage here gained being in the variety of colors which may be introduced. Here no restrictions are placed upon the number of different hues or shades which may occur in one line, weft-ways of the piece, whereas the production of such effects as these in the loom is not practicable unless special apparatus such as a swivel attachment be added. The embroidery machine also contributes its quota, often lending a remarkable degree of elaborate embellishment to structures which in themselves are quite simple. Spangles and similar adornments may also be found, side by side with plain satins which have been rendered ornate by artistic designs, floral and otherwise, painted in multi-colored pigments. These represent but a trivial portion of the crowd which vie with more genuine loom work for patronage from the "eternal

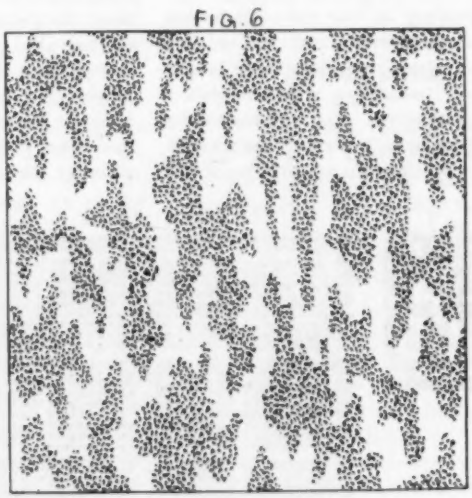


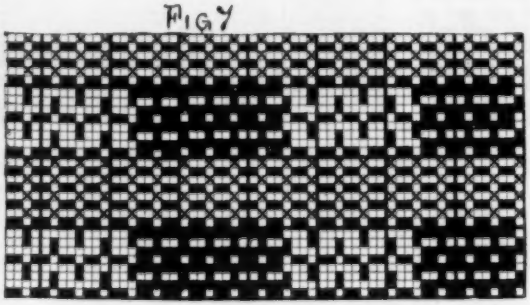
feminine," but it is nevertheless gratifying to note, that despite the invasion of such wares the most substantial, artistic and lasting textures may still be discovered amongst those developed entirely by the loom, and with a few types of this class it is the purpose of this article to deal.

One of the simplest and yet the most effective dress styles to be found consists of a modification of the ordinary double-plain, a brief description of the latter being appended.

Two plain structures generally of different shades or colors are woven simultaneously one above the other, and an ornamental pattern is produced by reversing the position of the upper and lower cloths. Probably the most frequently employed method consists in arranging the warp thread and thread with a pick and pick wefting. In one section the odd threads and picks weave a cloth of one solid color, and in the other section the even threads and picks make a texture different in color, consequently when preparing designs of these goods all that is necessary is to mark out the required figuring on design paper, then run one of the two weaves which are shown at Figures 1 and 2 on to this portion and the remaining one on to the ground.







Suitable weaving particulars for a woolen cloth of this description are as follows:

Warp:
1 thread 30 skeins wool—dark slate.
1 thread 30 skeins—lavender.
14s reed 4s.

Weft:
Same as warp.
56 threads and picks per inch.

In the modified styles to which reference has just been made one of the two cloths contains a larger number of threads and picks per inch than the other, the proportion ranging from twice to a dozen times as many, depending upon the quality and appearance desired as well as upon the counts of the yarns employed. The finer of the two structures which may be of silk or worsted is usually brought on the face, hiding the coarser one in the formation of figure whilst for the ground of the pattern the other series of threads and picks is raised, making more of a canvas style of texture and leaving the other cloth partly visible underneath, but affording sufficient contrast to render the ornament apparent. This interchange of position is in some cases all that is done in the way of stitching or fastening the two fabrics together. A more satisfactory method, however, is to stitch them together in those places where the figuring cloth is on the back, leaving it entirely free where it comes to the upper side to form the figure, as here the looseness and freshness resulting from the two cloths being left separate makes a desirable adjunct to the appearance of the goods when finished.

A diagrammatic representation has been prepared at Fig. 3 to assist the student in obtaining a more comprehensible idea of the make under consideration. In this particular instance there are eight threads and picks of fine to one of thick yarn and the fine fabric is on the back. Examination will show that the fine yarns are interlacing in plain order and also the thicker ones, and to bind the textures together certain of the back threads and picks are lifted over the face yarns in such places as will allow of their being rendered unnoticeable by the floating of the thick yarn. [The style of figuring most suitable for these fabrics should be composed of large well shaped masses in preference to small detail which, unless the whole be of extremely fine texture, cannot be satisfactorily reproduced.]

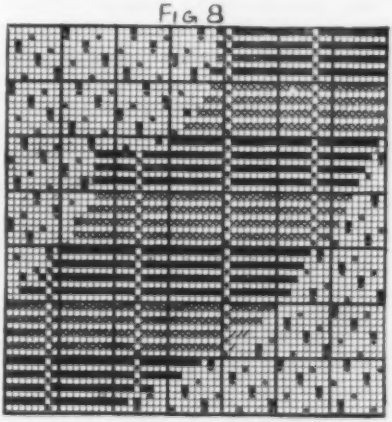
Warping and weaving particulars suitable for developing the above, as well as one or two other arrangements, are here given:

Warp:
8 threads of 4 dram dark crimson silk.
1 thread of 5s worsted – dark green or black.
Set in a 21s reed, 2 dents, with four ends each, and one with one end.
Weft:
8 picks of 4 dram silk– dark green.
1 pick of 5s worsted—dark green or black.
63 threads and picks per inch.

No. 2. Suitable for a three-and-one arrangement of fine and thick yarns:

Warp:
1 thread 20 denier silk (organzine)—slate shade.
1 thread 35 skeins wool—brown.
2 threads 20 denier silk (organzine)—slate shade.
24s reed 4s.

FIG 8



Weft:
1 pick 40 denier silk (tram)– electric blue shade.
1 pick 35 skeins wool—dark heliotrope.
2 picks 40 denier silk (tram) – electric blue shade.
96 threads and 80 picks per inch.

No. 3. An all-worsted texture arranged five and one:

Warp:
5 threads 2/66s worsted—chocolate shade.
1 thread 2/32s worsted—black.
5 threads 2/66s worsted—chocolate shade.
1 thread 2/32s worsted—black.
5 threads 2/66s worsted—chocolate shade.
1 thread 2/32s worsted—black.
5 threads 2/66s worsted– chocolate shade.
1 thread 2/32s worsted—black.
5 threads 2/66s worsted– dark green shade.
1 thread 2/32s worsted– black.
5 threads 2/66s worsted– dark green shade.
1 thread 2/32s worsted—black.
5 threads 2/66s worsted—dark green shade.
1 thread 2/32s wor-ted—black.
5 threads 2/66s worsted—dark green shade.
1 thread 2/32s worsted– black.
20s reed, with five ends in the first dent and one in the next alternately.
Weft:
Same as warp.
60 ends and picks per inch.

Figure 4 illustrates the manner in which the interlacing shown at Figure 3 would be represented on design paper, and Figure 5 gives the weave which would be employed for the figuring portions where both cloths are separate. The solid marks are for the silk yarns and the crosses and dots for the worsted.

Interesting crepon styles are made on this principle by using yarns possessing different shrinking properties, other modifications having knop yarns substituted for the heavier ones.

In the ornamentation of single make fabrics by means of either warp or weft flushes or a combination of the two there is always a danger of marring the strength and firmness through an insufficient portion being left for the ground, which is generally woven in a plain, twill, or other simple, crossing. This difficulty is overcome in a somewhat ingenious manner by developing the required ornament in an extra series of weft or warp threads.

An example of this method of procedure is shown in the elementary pattern Fig. 5 A.

Here an extra weft of thick yarn is introduced every third pick on a plain foundation cloth, floating on the face where figure is required and working in a broken warp swansdown arrangement in the ground of the fabric. The fulness of this extra weft should be sufficient to hide the intervening ground picks when pattern is being developed. Almost any style of ornament, so long as it is fairly bold in character, is workable on this system.

Fig. 5 might be woven as follows:

Warp:
All 2/60s worsted—scarlet.
18s reed 4s.

Weft:
2 picks of 2/66s worsted—scarlet.
1 pick of a worsted spiral yarn composed of 1 thread of 2/72s twisted with a thread of 2/36s—black.
72 threads and 90 picks per inch.

There are also many interesting developments of this scheme of fabric construction in evidence among textures for ladies' wear and in illustration of one ingenious method of utilizing its possibilities the following short description is given.

The fabric appeared at first glance to be covered with a pronounced fancy moire or watered effect; on a somewhat nearer inspection its beauty conveyed the impression of a warp-printed style, but analysis showed that neither of these methods of ornamentation were responsible for its attractiveness.

The real reason was found to lie in a colored thread arrangement for the warp yarns in combination with a suitable style of pattern produced on the same "extra weft" principle as that illustrated in Fig. 4. Without this extra weft figure the pattern would have been a simple stripe, the warp being made as follows:

6 threads 2/60s mercerized cotton—dark claret shade.
6 threads 2/60s mercerized cotton—medium claret shade.
6 threads 2/60s mercerized cotton—light claret shade.
6 threads 2/60s mercerized cotton—dark green olive.
6 threads 2/60s mercerized cotton—medium green olive.
6 threads 2/60s mercerized cotton—light green olive.
20s reed 3s.

But by the introduction of extra weft developed figure, similar in shape to that shown at Fig. 6, the whole aspect of the pattern is modified. The warp colorings being visible only between the broken shapes caused by the additional series of black picks do not appear at all as stripes, but simply afford a delightfully bright contrast with the rest of the pattern.

Weft particulars are here given:

1 pick 2/60s cotton—black.
1 pick 2/30s worsted—black.
(This pick is for the figuring.)
1 pick 2/60s cotton—black.

The extra pick floats on the surface to form the dark portions shown in the sketch, and is underneath at other times, only being stitched where the length of float renders it necessary.

Figure 7 is the complete weaving plan for a neat type of corded or ribbed texture, the cords running from selvedge to selvedge of the piece. This make of fabric has been largely in prominence lately and when worked out in soft colorings makes a very acceptable article. The following weaving particulars will indicate the actual construction.

Warp:
2 threads 2/60s worsted—brown.
1 thread single 40s cotton—black.
2 threads 2/60s worsted—brown.
1 thread 40s cotton—black.
2 threads 2/60s worsted—brown.
1 thread 40s cotton—black.
2 threads 2/60s worsted—brown.
1 thread 40s cotton—black. } for 18
2 threads 2/60s worsted—black. } threads.
1 thread 40s cotton—black. } for 15
2 threads 2/60s worsted—brown. } threads.
1 thread 40s cotton—black. } for 13
2 threads 2/60s worsted—brown. } threads.
30s reed 3s.

Weft:
1 pick 2/80s cotton—black. } for 8
1 pick 60s 2 fold silk—old gold. } picks.
1 pick 2/80s cotton—black.
1 pick 16 skeins wool for wadding—black for eight picks.
1 pick 2/80s cotton—black. } for 8
1 pick 60s 2 fold silk—old gold. } picks.
1 pick 2/80s cotton—black.
1 pick 16 skeins wool for wadding—black for six picks.
90 threads and 40 picks per inch.

face for the figure were stitched in ten heald satin order to the ground, but where the figuring occurred these picks flushed over twelve threads and under one, giving a ribbed or fluted appearance to the pattern whilst the ground picks floated underneath, twelve and one, leaving the warp lying loosely between the two wefts. The different colors employed are indicated by crosses and solid black marks respectively, and the interlacings for the ground by dots.

Suitable weaving particulars are appended, from which a clearer insight may be gained into the construction of this texture.

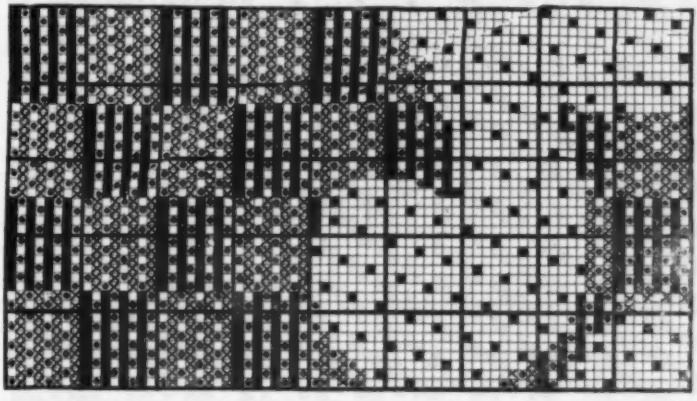


FIG. 9.

Another ingenious treatment in the way of figure development is given in the sectional plan, Fig. 8, which has been made from a warp faced texture solid in color, and ornamented with an all-over style of pattern in two colors of weft, four picks of one color and four of the other, contrasting strongly with the ground, but prevented from exhibiting any objectionable bars, weft-ways across the piece, by the outlined type of figure which was adopted, no large masses being visible throughout the repeat. The foundation cloth was made from the five shaft satin weave, all the warp threads and every other pick being employed for the purpose; the remaining picks, when not brought on the

Warp:
All 2/66s worsted—dark brown shade.
22s reed 5s.

Weft:
1 pick 2/70s cotton—brown.
1 pick 4 dram silk (double)—helio-trope. } for 8 picks.
1 pick 2/70s cotton—brown.
1 pick 4 dram silk (double)—electric blue. } for 8 picks.
110 threads and 100 picks per inch.

The next structure to which attention will be directed is somewhat similar in character, but in this instance the additional weft yarns are utilized for the ground, producing, in conjunction with the ordinary picks, a hop-sack effect in two colors, whilst the decorative portions of the fabric,—which should receive bold ornamental treatment,—are developed in a warp sateen make.

A reference to the section worked

out at Figure 9 will materially assist in a clear comprehension being arrived at. The lower portion shows the construction of the ground. Under each series of weft flushes, it will be noticed that a plain cloth is being formed, preventing any possibility of the piece becoming unstable and flimsy, whilst the upper part of the plan indicates the method of developing the figure, using in this case the eleven shaft sateen.

Suitable instructions for weaving this make are here appended:

Warp:
All 2/48s black worsted.
19s reed 4s.
Weft:
1 pick 2/60s black worsted.
1 pick 6 dram white silk.
76 ends and 104 picks per inch.

At Figure 10 is exemplified another cleverly wrought combination of yarns, weave and color. This is a texture double in the warp and single weft ways, the extra warp yarns, which are inserted between every pair of ground threads being employed for figuring purposes.

It will be seen that the texture proper, disregarding for the moment the figuring warp, is weaving common two and two twill, and the threads and picks comprising it are arranged in a four and four order of coloring, thus producing a neat Shepherd plaid effect.

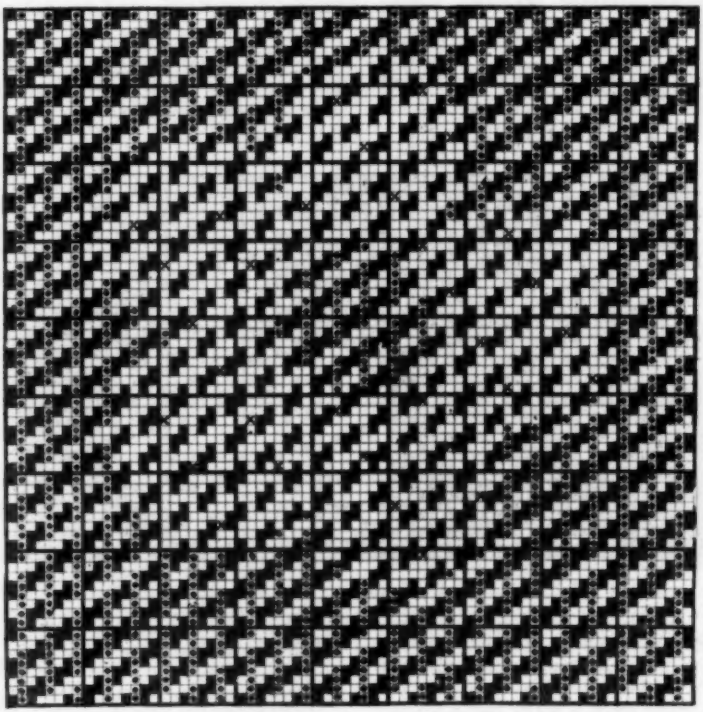


FIG. 10.

Now, wherever figuring is desired, the other series of warp yarns is brought on the face and there floated to such a degree as will completely conceal the checked ground. This is shown in the central part of the plan where a floral shape is introduced whose development is due to the extra threads working in sixteen shaft warp satin order, shown by crosses. On the completion of the figure these yarns retire to the back of the cloth, each one being stitched to the face on every eighth pick, in twill order, and in such

places as will be least likely to show, viz., where face warp yarns are up on either side.

Here again the style of design requires to be large in character to develop advantageously, and by a judicious assortment of colors for the checks and figure respectively some highly effective patterns may be produced. A specimen of weaving particulars is as follows:

Warp:
1 thread 2/60s worsted—scarlet.
1 thread 2/24s worsted (for figuring)—black.
2 threads 2/60s worsted—scarlet.
1 thread 2/24s worsted—bl ck.
1 thread 2/60s worsted—scarlet.
1 thread 2/60s worsted—grass green.
1 thread 2/24s worsted—black.
2 thread 2/60s worsted—grass green.
1 thread 2/24s worsted—black.
1 thread 2/60s worsted - grass green.
30s reed 3s.

Weft:
4 picks single 30s worsted—scarlet.
4 picks single 30s worsted—grass green.
90 threads and 52 picks per inch.

Space does not permit of the inclusion of many another specimen of the artists' and craftsmen's skill, so abundantly to be discovered amongst this branch of the textile industry, and so well deserving of mention on account of their novelty of structure, harmony of color, or special yarn arrangements. But bare mention alone would mean the filling of volumes rather than pages and the devotion of a lengthy lifetime to the task.

Special departments, take for example that of gauze weaving, have been of necessity omitted, and yet numerous instances occur in which the doup system of harness mounting has furnished excellent contributions to the dress trade; the different systems of crossing, and the novelties which may be made to accrue from employing threads of varying thickness, lend themselves at the hands of the master of his craft to unique productions.

In the manufacture of plush and velvet goods also have great advances been witnessed. In some of the best styles, which embody textures having piles of different heights, cut and looped, mellowing or brightening the hues of the yarns composing them, skilfully distributed over elaborately constructed grounds, it would indeed be a matter of difficulty to equal in beauty either the design or the color exhibited upon them, for in many instances they already appear to have practically attained perfection.

How Those Engaged in Weaving Should Study Their Work.

THOS. R. ASHENHURST.

Many persons engaged in the weaving department have the same idea of the necessity of studying the principles and details of their work as the Irishman, who, when asked why he didn't pay more attention to the cultivation of the potato, innocently answered, "Shure, the potato doesn't need cultivation, it grows itself."

Weavers, loom-fixers and others consider that the loom does the work, and it is their duty to watch it and keep it going, but a great deal more than that is called for from everyone if good work is produced, and loss incurred by the manufacturer in making allowances on his goods or selling them below cost, prevented.

To begin with the weaver, I will suppose it is a woman or girl, though they are by no means worse than many of the men in the matter of carelessness. Broken picks are very often looked upon as matters of little moment yet if weavers saw some of their pieces in the finished state, or more especially, if they were asked to buy them, they would probably think very differently. This fault, a most serious one in many classes of goods, and one to be avoided in all,—may arise from many causes, as carelessness in not watching when the bobbin is running out; neglect to find the pick; the filling cutting in the box; cracked bobbins; badly spun yarn, and many other causes. Whenever it arises from any but the first of these, the weaver should call her loom fixer and in the meantime endeavor to ascertain herself the primary cause so that she can assist him and save both his time and her own. There are always pretty clear indications as to the probable cause, such as the weft carrying a

certain distance into the piece, breaking off and catching on again. In such cases the weft fork,—except the centre fork,—is inoperative and as the loom does not stop she doesn't see it until it has gone some distance, and then neither pulls back nor fetches her loom fixer, feeling, perhaps, that the blame is not hers. If it is cut in the box it can easily be determined at which side of the loom it is occurring by the length of yarn carried in and where it catches on again, then the remedy can be easily applied but if she has not observed this the loom fixer may look on for a time and it does not happen. Then he leaves it with the remark, there is nothing wrong; and so it may be with other causes. It should be the weaver's duty to study every little point and have any apparently trifling matter put right before proceeding with her work.

In the same way, with ends of the warp breaking down. Very frequently a warp is condemned as bad when there is really nothing the matter with it but the setting of the loom. The sheds may be unequal in tension; one harness may be rising too high or set too low: the weaver goes on tying ends up, spoiling work and blaming the warp; and at the same time a warp from the same yarn, and weaving the same pattern, is going all right in another loom. What is easier than to observe whether all the threads which break are drawn on the same harness; whether they break at about the same point or whether they appear to be cut or torn asunder. Observation of these trifles will facilitate the remedying of the evil. An intelligent weaver, if properly directed by her loom fixer, will very soon pay attention to these matters and save trouble for both.

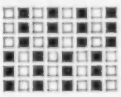
Probably one of the most serious troubles with weavers is when weaving goods that are "cross drafted," that is, when the threads of the warp are not drawn in consecutive order through the harnesses. If only one thread is broken at a place there is only one empty harness. Therefore, no mistake can be made; but if there are several, she is often at a loss how to put them in, and although she may think she is doing her best she is in great measure "trusting to Providence," with the result that a stripe, not intended as part of the pattern, runs through the piece and is not discovered until looked over in the piece room.

Every weaver should study the draft of the pattern she is weaving and be familiar with it before she has woven many yards. Of course this applies to the weaving of fancy goods more than plain ones. In many cases it must be admitted that the troubles of the weaver are intensified by the manner in which the designer arranges his drafts, making them more complicated than they need be, though he is not always at fault.

The loom fixer is as much at fault in this respect as the weaver, in many cases, and it would pay the manufacturers of fancy goods to have all their loom fixers take a course of instruction in the arrangement of elementary designs, and the principles of drafting, under competent teachers, and insist that as every new warp goes into a loom he should instruct the weaver in the draft of that particular pattern. Many mistakes would be avoided and consequently fewer spoilt pieces.

Much more might be said about the weaver, but a few words must be said of others. The loom fixer in many cases underrates his responsibility. It should be his duty to see that every weaver not only knows her work, but properly attends to it, and report to him the slightest fault occurring in the working of the loom, and to immediately correct it. Every new style of goods coming to him should be carefully considered so as to know exactly how to set the loom to weave it to the best advantage, and to discover also, if it should start up badly, what is the probable cause. It may be the setting of the loom, the improper tension on the sheds, as in the case of these being a heavy one and a light one, as with a cloth where all the warp is on the face or the reverse, where the pattern makes a sudden change, etc.

One illustration will show what is meant by this. In weaving ribbed cloths, where the rib runs across the piece as in the pattern given here.



Three picks go together in one shed and the warp remains open for those three picks, except, it may be, that a binding thread is working as is often the case; then there is a complete change, all the threads reversing their positions. If the warp is of a rough or fibrous character the first shed after the crossing, will not be clear, and a pick thrown in then is liable to skip a good many threads, and produce serious faults.

A carefully observant loom fixer will at once determine what to do. He will send an empty shuttle through the first shed to clear it so that the shuttle carrying the yarn in the following pick will not be obstructed by the entangled fibres; and there will be little danger of its passing over or under threads which it ought not to pass over or under. There will of course be some loss of production, but this will be more than compensated for in good cloth.

So far, these remarks apply only to the general observations of the loom fixer and his duties to the weaver, but there is much more for him to observe in the details of the working parts of the loom. It should not be sufficient for him to let a loom go as long as it will run at all. It is not sufficient, if the shuttle is not flying out, to say the picking arrangement is in good order. He may be wearing out picking straps, pickers, shuttles, or giving the loom double the amount of work to do that is necessary. It is his duty to see that every part is properly set so that he is not exercising undue force in sending the shuttle across the loom, and causing violent reaction when the pick is delivered, but that the action is as smooth as possible with no more force to get the shuttle out of one box and into the other than is necessary in the proper time. It is well known that there is no part of the loom which can give more trouble, and be the cause of more wear and tear, not only to the picking arrangement itself, but to the whole loom, than a badly set picking motion.

This is merely mentioned as one item, but every part of the loom should receive equally careful attention. Not only that, but the timing of the several parts in relation to one another.

Probably no part of the work has more influence upon the production of a good cloth than the timing of the opening and closing of the shed in relation to the beating up of the weft by the reed. Every good loom fixer knows that there can be no fixed rule laid down for this which will apply to all classes of fabrics; but careful observation will enable him to determine with some degree of precision what the relations should be for any cloth which comes before him. In other words the loom fixer should not work always on exactly the same lines, but study all the conditions and be observant at all times making his observations on one class of goods serve as a guide to him, as to how to set his loom for any other.

A great deal may be said also on the work in the warping and warp dressing rooms, as many serious faults arise from negligence or ignorance in those departments, and which can neither be corrected in the weaving nor finishing of the pieces, and probably cause increased cost in mending.

As every one knows, where a piece is badly woven no amount of mending can ever make it as good as if it had been properly made in the first place.

Then the summary of all this is simply, that every one engaged in the weaving department should study in their own work everything which will assist in the production of perfect goods and the prevention of waste; and that every stage of the work from the first preparation of the warp to the woven fabric should be done with a view to forwarding this object at every subsequent stage—not let each one be content to get the work out of his or her hands and leave someone else to correct their faults.

The Science and Practice of the Construction of Woven Textures.

FRED BRADBURY.

(Continued from September.)

For the purpose of illustration a portion of the figured cloth given at Fig. 44, has been transferred to special point paper at Fig. 52. It is ruled in squares of 7x3, or 7 threads of warp by 3 threads of weft, so that the figure sketched and developed upon paper will be of the same proportion as it has to be in the actual woven fabric. In the manufacture of this cloth it will be found most convenient and least expensive to draft the warp threads upon seven rows of harness, so that if the jacquard machine is tied up for eight rows, the eighth, or back, row of harness mails would be cast out, i. e., left without any threads, assuming that the fineness of the set in the harness cords would admit of it. But if any further reduction in the fineness of set of harness were required they would have to be cast out upon the ordinary method of leaving the required number of empty rows of mails from the front to the back of the harness. This method, as will presently be seen, possesses the advantage of saving much of the development and makes it possible to cut the jacquard cards with considerably less trouble and time. If on the contrary, it should be necessary to draft the warp threads through the harness upon all the eight rows, then it would be incumbent upon the designer to fully develop the whole figured design, of which that shown at Fig. 52 is only a small portion, otherwise the card cutter would find it most difficult if not impossible to cut the cards correctly.

In the sketch given at Fig. 52 the shaded portion of the design is intended for the rib surface while the ground is left for the prunelle. Then to fully develop this figured design the plan or model design given at Fig. 50, should be put upon the ground, and that of Fig. 51 upon the figured section. But I might also point out that the 2nd and 3rd pick of design Fig. 50 are respectively alike throughout the whole design and that the same relative picks of design Fig. 51 are also respectively alike throughout the whole design, but exactly the reverse of those corresponding picks in design Fig. 50. The weft thread d of Fig. 50 is also the converse of the weft d in Fig. 51, but there are three picks of each before they begin to repeat again, consequently if it were necessary to develop the whole figure we might with advantage work out only one of the designs, say, e. g., Fig. 51, since it contains the fewest markings. The card cutter would then have to cut marks thus X upon the figure and all blank squares in the ground, or cut black in figure and white in ground.

Further, since we have arranged to use only seven rows of harness, therefore seven rows of needles are only necessary to control the harness, and seven rows of holes or blanks or both along the length of the jacquard card; hence seven rows of pins in the plate or piano card cutting machine are necessary.

Then since every pick or horizontal line of small squares represents one card and there are seven threads of warp in every large square, every one of these larger squares represents one tread of the piano machine, one row across the plate machine and one row across the width of the jacquard card.

If now, reference be made to the design at Fig. 51 it will be seen that when the weft e is inserted the third and seventh are the only threads which have to be raised in the figure, but these are the only threads which are not lifted in the ground. Also at the insertion of each pick of weft f, the fifth thread of every square is only lifted in the figure, but in the ground this is the only thread left down in each square, consequently it will be evident that these facts can be so easily remembered that it is not necessary to put more than the first of picks e and f upon the point paper

which contains the figured pattern. It is only essential to correctly outline the sketch and to indicate the weave for the first pick of each large square, as shown at Fig 52, and then write out for the cutter instructions similar to the following.

(1) For the first pick of each large square cut marks thus "X" in figure, and white ground, insert cotton

lustrated at Fig. 53, where I have represented portion of three jacquard cards as they would appear when cut for the first three picks d, e, f, of the point paper design given at Fig. 52. The cards are lettered D', E', F', so as to coincide with the respective picks of weft, as represented on the point paper. The circular black marks indicate where the holes

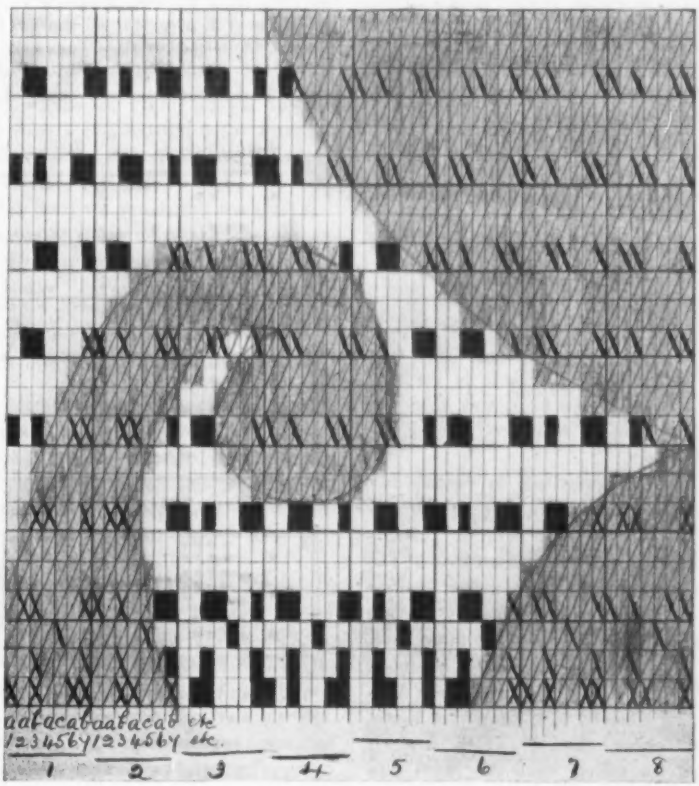


FIG. 52.

weft d. (2) For the second pick of each square cut every third and seventh thread in figure and all but the third and seventh thread in ground—insert thick cotton weft e. (3) For the third pick of each square cut every fifth thread in the figure, and all, except this thread, in the ground—insert cotton weft f.

The instructions for cutting the jacquard cards, as above, are fully il-

are cut in the card to allow the required needle to pass through, by which medium the corresponding warp threads are raised so as to allow the weft to pass under. It will be observed that there are no markings upon the eighth row. This is because the needles and hooks with the harness cords which this row controls are not in use or "cast out."

If card D' be compared with the

first pick of the design at Fig. 52 it will be seen that holes are indicated as cut upon the 1, 3, 6 and 7 rows in this card which exactly coincides with the raising marks (X) of the first square on the first pick d. Similarly for the second square of the same pick, holes are cut in the card to lift threads 3, 4 and 7. For the next square, which is in the ground, the white spaces 1, 4, 5 and 6 are cut; and also for the 4th square of the same pick, the white space 2, 4, and 5 are indicated as cut in the card. The reader will be able to follow and trace out the rest for himself.

Upon the card E′ it will be observed that three and seven rows of the shaded portions are cut upon the card, while the 1, 2, 4, 5 and 6 are cut upon the card where the design indicates ground. But upon the card F′, a hole is only cut in the fifth row, where the pattern is shaded, but upon the 1, 2, 3, 4, 6 and 7 rows where the pattern represents ground. Hence it is for this reason that the picks e and f do not require to be fully worked out on the point paper.

It is now opportune to confine my remarks to an explanation of the setting of the several sets of threads which compose the structure of the compound fabric now under discussion. The rib structure is the portion of cloth which requires the most care, and when this is properly balanced the 2 ÷ by 1 twill may with less difficulty be adapted to it than vice versa. Then taking the rib cloth first it should be noted that the weft lies straight with the exception of the tieing pick d which is turned out of its course by so doing. The warp threads bend as much as it is ever possible therefore one repeat of the rib in the direction of the length of the piece is equal to the combined diameter of the threads composing it, which, upon referring to Fig. 49, show that there are two warp threads b and c, and three weft threads d, e and f. Note. The binding weft thread e binds once in each repeat of the rib, therefore it must also be included; but when the rib cloth is made separately this weft thread d would of course be absent. Further, if there were no compression to take into consideration the combined diameters of b, c, d, e and f would equal

$$\tfrac{1}{112} + \tfrac{1}{130} + \tfrac{1}{130} + \tfrac{1}{30} + \tfrac{1}{130} = (\tfrac{1}{112} + \tfrac{1}{130}) + \tfrac{3}{130} = ([3 \times 112) + \tfrac{1}{130}] \div [112 \times 130)] + \tfrac{3}{130} = \tfrac{1}{4334_0} + \tfrac{3}{130} = \tfrac{1}{36} + \tfrac{3}{130} = (36 + 31) \div (31 \times 36) = 1 \div 16.6,$$ or 16⅔ ribs per inch.

But the actual cloth contains 18½ ribs. The difference is accounted for

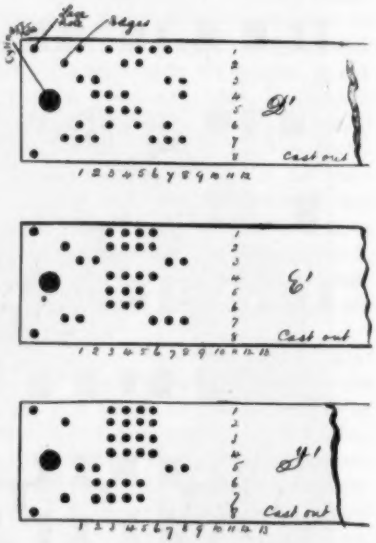


FIG. 53.

in the compression of the warp threads which pass over the thick material forming the body of the rib. But this compression of the warp at right angles to the weft involves an increase in the diameter of the warp threads across the direction of the warp which is parallel with the weft, hence the setting of the warp threads must be arranged to allow for this increase of diameter of warp. In the actual finished fabric it will be seen

that this increase of diameter of warp coincides with the theoretical conditions. In the actual rib cloth the warp threads b and c are compressed so much that their peripheries are in contact with each other, hence their average diameter of the warp in the direction of the weft is equal to the threads of warp composing one repeat of the rib structure, viz. 44 Botany plus 22 cotton equals 66 or 1-66 of an inch. Then by formula VI, page 62, July '98, we may readily determine the average reduced diameter of the three warps at right angles to the weft thus: original diameter squared divided by increased diameter equals decreased diameter.

First then we must find the average diameter of these warp threads before compression takes place, thus:

$(\frac{1}{130} + \frac{1}{112} + \frac{1}{112}) \div 3 = ([(2 \times 130) + 112] \div [112 \times 130]) \div 3 = 372 \div (14560 \times 3) = \frac{1}{117}$ = average diameter before compression.

Then $(\frac{1}{117} \times \frac{1}{117}) \div \frac{1}{66} = 66 \div (117 \times 117) = \frac{1}{207}$ = average diameter after compression.

I. e., the average diameter of warp threads b, b, and c may be each taken as 1-207″ at the point of intersection with the thick weft. Then the number of ribs per inch will be found theoretically to equal

$b + c + d + e + f = \frac{1}{207} + \frac{1}{207} + \frac{1}{130} + \frac{1}{65} + \frac{1}{130} = \frac{1}{207} + \frac{1}{65} + \frac{1}{65} = [207 + (36 + 65)] \div (36 \times 65) = \frac{1}{207} + \frac{1}{23} = [207 + (23 \times 2)] \div (207 \times 23) = \frac{1}{207} = 1 \div 18.8$, or 18 to 19 ribs per inch.

We have seen that the actual cloth contains 18½, which, therefore, proves that the theory and practice of the construction of the rib texture coincides when diameter, angle of curvature and compression are fully considered.

Reverting now to the second cloth which forms a part of the compound structure, we shall readily perceive that the warp threads are set closer together than would be necessary to weave this structure on the "square," I. e., with warp and weft threads equal and with the warp twill running at the normal angle of 45°, in which case the number of threads of warp and weft for the cloth, if detached from the rib would be determined by the application of the following simple formula which is really a slight modification of Formula I, since, in the present case the diameter of warp and weft are different, while that of formula I treats them as of the same thickness.

(Dia. of warp in 1 repeat + dia. of intersecting thread in 1 repeat) ÷ number of threads in 1 repeat = $(\frac{1}{112} + \frac{1}{130}) \div 3 = ([(3 \times 130) + (2 \times 112)] \div [112 \times 130]) \div 3 = 614 \div (112 \times 130 \times 3) = 71$ threads of warp per inch.

But the actual cloth contains 88 threads per inch or 24 per cent. more than would be necessary in an ordinary cloth. It is this increase in the number of warp threads together with the decreased number of weft picks which gives to the cloth a vertical or buckskin rib appearance. This latter cloth would, if woven apart from the horizontal rib structure, be a very loose texture unless the number of weft threads were increased; but it should be noted that strength is given to it by each pick of its weft binding once in every repeat with the bolder rib cloth, which has always a modifying effect upon the structure of cloth.

Any explanation of the science and practice of such compound structures as last considered is necessarily inadequate and incomplete without a full consideration of the varying tensions upon the warp threads involved in their production.

Reverting to the last foregoing texture it will be observed that the two Botany warps, dark brown and light brown are respectively 17½ and 32½ per cent. shorter in length in the finished piece than when compared with their original warp lengths. Since each warp is all fine wool, and of similar quality they naturally shrink somewhat in length, but the considerably increased reduction in length of

the light brown warp is due chiefly to the weave structure. The take-up in length of the light brown cotton warp is entirely the result of the method of interlacing and of the angle of curvature formed by the warp. The truth of this assertion will be evident if a reference be now made to the rib portion of the cloth of which a photograph was supplied at Fig. 44 (September issue), together with a cross section through the warp, at Fig. 48 (September issue). It should be distinctly understood, as it will doubtless be observed, that the rib cloth is primarily made bold or distinct according to the thickness of the thick, straight cotton filling weft and that the take-up in the warp length will be largely modified by the thickness of this weft. Hence the light brown wool warp in its repeated passages from the upper to the under side, and vice versa, of the thick, straight cotton weft, not only produces all the bending, but necessarily requires a considerable amount of extra length of warp in the formation of the ribs, i. e., the distinct ridges and furrows across the width of the piece. For the same reason the cotton warp loses 17½ per cent. of length, otherwise it is, as is generally known—a non-shrinking material.

Whenever there are varying degrees of tension or take-up in the warps of any woven texture, whether due to the employment of two or more weaves of diverse interlacings, or to the varying shrinking qualities of the materials used in the composition of the woven fabric, such, for example, as the foregoing differences of take-up of the warp in the rib as compared with that of the prunelle portion, of which both are in the same fabric, and also in figured pile fabrics and Brussels carpets, where the relative take-up of each figuring thread is an unknown quantity, each must be separately controlled according to the relative variation of tension upon an individual or a collective set of threads. In the case of the individual variation each thread is separately controlled by small weights which seldom exceed 4 ounces. But the relative variation and tension upon a collective set of warp threads require to be controlled, not only as a separate factor from some other set, but each set requires very careful adjustment, otherwise the least variation in tension will cause what is known in practice as "motion marked pieces."

(To be continued.)

Notes for Finishing Department.

The presence of certain foreign materials in the cloth which the finisher has got to handle often goes a long way towards making his work tedious and unsatisfactory in its results. If we have been giving a certain grade of goods a particular course of treatment, knowing well what succession of details will give the best results, and always following out that succession with good effect, all at once we may be surprised to discover that things are going wrong. The finish is not so good, the feel is bad, the colors are dead and lifeless. It is hard to know just why such should be the case and the finisher must be able to trace the difficulty to its den.

It may be that there is a certain change which has been made in the preliminary work and treatment of which he has not been made aware. How greatly it would simplify matters and what an amount of damaged product might be saved, if those who have in hand the actual making of yarns and cloth would only notify the finisher when these apparently slight and unimportant changes have been made. It may be a new lot of oil is used in preparing the stock, it may be a slightly different grade of stock, it may be a little different treatment in the dyehouse, a slight modification in carding, a little less or more of twist, or an insignificant change in tension or in conditions at the loom. It would help if this could only be noted and sent along the line with the goods or with the stock, so that when the finisher got it he would be prepared and

could govern himself accordingly. There is no question that an arrangement of this kind would very materially aid in the saving of many seconds, and in the production of more uniform and better work.

Suppose without the finisher's knowledge materials have been introduced into the cloth, or into the stock, or yarn, to increase the weight or stiffness of the goods or to alter or enhance the feel and handle of the fabric. It is to the finisher's advantage to be made aware of the change, and perhaps a method by which the presence of these materials may be detected might be a valuable piece of information for him to possess.

A little nitric acid properly employed will serve to show if any of these substances are present. And if they are present, of course the finisher must shape his treatment of the cloth accordingly. If a streak of the acid is made on a woolen cloth which has any of these substances in it, a change of color will take place to a yellow brown, and this will be darker according to the amount of foreign matter present, and according to the concentration of the acid used. For the most part a two per cent. solution of the acid will usually be about the thing. Have on hand a four-ounce bottle of this solution with glass stopper, and keep it so that light will be excluded. When you wish to test for any foreign agents of the kind we have mentioned, take the moistened glass cork and draw it over the surface of the cloth, and if any of the substances are present the change of color we have remarked will take place. A better way still, because more sure, will be to wet the finger slightly with the acid and then draw a streak of the acid solution on the cloth with the finger.

Wherever these materials are present we will have to be careful of our different processes, but finishing must be very cautiously handled, the greatest attention being given so as to keep all the substance possible in the cloth. The drying and pressing may perhaps have to be modified also to some extent, in order not to avoid losing the effect of the weighting or stiffening materials, but to make them have their due and desired action on the finished product.

There is nothing that is any more annoying to the finisher than to have changes made in the oils that are employed in preparing the stocks for carding or spinning. If a new oil is introduced, or if even a new lot of the same brand is used, or if oiled stock is allowed to lie about when it should be pushed ahead, there will be a very appreciable difference in the fulling qualities of the stock, and in the way it will act in the scouring and wet finishing processes. An oil that is more adherent than another will always need more rigorous handling in the washing, or else a greater alkaline strength in the soap employed in fulling and washing; and the result cannot help but be a change in the feel of the finish, and perhaps an injurious effect upon colors.

The body of the cloth, and the condition of the felt, while essential qualities of the woolen fabric, are very easily affected by undue changes in these processes. Any alteration in the conditions of the cloth which comes to the finisher, that entails added work, or stronger soaps, in the wet finishing, is sure to be attended with results that lack uniformity. If the finisher were in possession of a knowledge of these changes, his work would be greatly helped.

MANUFACTURER.

Storm Serges.

The finishing of this class of goods presents some features which few finishers are fortunate enough to have a chance to study, and while the whole procedure is in some respects similar to the finishing of other worsted fabrics, there is still a wide difference from the usual way of handling worsted goods. Storm serges properly belong in the class of ladies' dress goods, although many of them find their way into cheap suits for men's

wear. The initial process, the burling, need not be described particularly at this time, having been often enough explained before in these columns, but on account of the recent introduction of shearing machinery where the rest over which the cloth passes contains a rubber tube into which knots will sink and thus prevent the cutting of holes, the back burling has in many places been discontinued altogether. During the past year we have handled many thousand pieces of serges of all kinds for ladies' wear as well as other kinds of ladies' dress goods which were never touched on the back by the burlers.

It will be readily understood that this effects quite a saving, in fact does away with half of the labor of burling and it is therefore predicted that the new kind of shear will soon make many friends for itself. In the near future we shall take occasion to describe this shear at length. The mending process is hardly ever resorted to on storm serges, in fact many classes of dress goods never receive any attention of this nature, which goes to show that it is easier to pass a piece of goods intended for ladies' wear than what it is to pass men's wear goods.

After the burling has been performed satisfactorily the goods are ready for the next step. They are now laid out in lots of say 16 or 20 pieces, enough to make a fair sized roll and the ends are sewn together with the seam on the back. That is to say they are laid out face to face which will of course bring the seam on the back. This is made necessary on account of the next operation, which is the singeing. Quite a difference of opinion exists with regard to this part of the work, for some hold that a better looking piece of cloth is obtained by singeing them over copper plates, while others contend that gas singeing is the best. However, this matters little for there are very few places today but what use gas for this purpose. The singeing is performed for the purpose of removing all fibres on the face of the goods which in the ordinary course of handling are sure to rise and thus clears out the weave and prevents these fibres from felting on the face and producing a mottled appearance. The machines used for this purpose are of various patterns, but they all are provided with a means of regulating the speed of the goods so that they may be run at the speed required for the class in hand and to do the best and most thorough work. Of course, gas without a proper combination of air is of very little use and therefore these machines are furnished with an air blast apparatus. The size of the flame can also be regulated at will, but the chief point to look out for is the flame itself, for to do good work this must be supplied with enough air to have a clear blue flame, and the force of the air will drive the flame right into all crevices. No doubt all this will also be simplified in the near future, for already trials have been successfully made with electricity as the singeing agent. As yet, however, we do not know of a case where this system has been regularly adopted, but it is sure to come.

After the singeing comes the wet finishing process which consists first of the loosening and subsequent removal of the sizing contained in the warp and next in what is termed the fixing. The warp of worsted dress goods is sized to quite an extent with glue or similar substances, to make it better able to stand the weaving process, and all this stuff must be softened and dissolved and completely removed. For this purpose we use the crabbing machine which consists of a pair of squeeze rolls set in a tank in which the rolls revolve. There is also an attachment for beaming the goods and an extra tank which is used for cooling purposes. The goods are first beamed on the beaming apparatus and this must be done carefully so that they may run straight when beaming them on the roll. It is not beneficial to the goods if they have to be pulled much while beaming them on the squeeze roll, and it can be avoided by a little care when beaming them at first. Af-

ter being properly beamed, the goods are wound on the lower one of the squeeze rolls, after filling the tank with water, so that one-half of the lower roll is immersed. This water is then heated to about 125° F., and a little soda or pearl ash is added which will facilitate the process. When all the pieces have been wound on the lower roll the goods are kept running on this for about twenty or twenty-five minutes, the top roll exerting a uniform pressure all the time and the water kept at the heat stated. After this it is run back again and beamed on a wooden roll and left standing from one-half to three-quarters of an hour in order to soak the sizing thoroughly. The roll must be turned once in a while so the sizing will not draw to one side. In order to do the work with any kind of economy it is usual to employ two of these machines so that on one the goods may be steeped and scoured while on the other the next process, the fixing, may be performed and thus keep things going along, the two machines working harmoniously. When the pieces have been thoroughly soaked they are run again on the lower roll of the next machine, passing through boiling water and having the tank filled as before. On this second or fixing bath the goods are given about fifteen minutes' running in the boiling water and the nature of the finish is here taken into consideration for the pressure must be regulated accordingly.

If the goods should be wanted to feel loose and spongy, the pressure is reduced; while a firm feeling piece needs firm pressure. It is necessary that the temperature of the fixing bath should be as high, at least, as the temperature of any following wet process, for if the temperature of the dye bath should be higher than that of the fixing bath the goods will not be what they ought, for the last bath will undo the work of the former. When the goods have been run in the boiling water the required length of time, they are passed through the second tank which is filled with cold water and beamed on wooden rolls. This is termed the cooling process and after that they are ready for the washing machine. The old-fashioned washing machines are fast disappearing, and in their place we have what is termed the flat washing machine. Here the goods are run open instead of in the shape of a rope as in the old style machines. This leaves the goods nice and smooth and greatly enhances their appearance when finished. For the washing, a thin bodied soap is used and in many places simply a solution of pearl ash in preference of soda. When goods are clean and all traces of soap well rinsed out, they are treated with a saturated solution of Fuller's earth which will surely remove all traces of soap and will also tend to make the colors appear brighter and more uniform. When this last treatment is omitted there is generally trouble with clouds and streaks. The goods are then ready for the dyeing, and when that has been completed another washing, or rinsing, rather, is in order which should also be performed in a flat washer, after which another bath of Fuller's earth will leave the goods in the best possible condition. The drying is the next operation, and here again we find quite a difference of opinion.

It is generally held that worsted goods should be dried gently with good ventilation or else they are said to become hard and look bad, but we have carefully tried this plan as well as quick drying, and are unable to detect any difference in looks or feeling, and as the quick drying is on the side of economy have adopted this method, at least on this class of goods. After they are dry the goods are carefully inspected and shaded and are then specked so that afterwards they need not be touched on the face again. When the specking is completed they are ready for the shear, and if the singeing has been properly performed one end over the shear is generally sufficient. They are then taken and laid out again and the ends sewn together and are taken to the stiffening

pad where they receive a sizing of a solution of Irish Moss. The goods are passed through a tank containing the sizing in a nearly boiling condition and are then passed through a pair of squeeze rolls, when they come out all right for the final drying. For the last drying we employ a machine which is in the shape of a Rice, Barton & Fales dryer, but really consists of a copper drum around which passes an endless blanket. The goods are deposited upon this blanket stretched to the proper width and the drum containing steam dries the goods as they pass along with the blanket. The machine is provided with a folding attachment which leaves the goods in perfect condition for the final inspection. They are then doubled, face out, rolled and measured and put up in the approved manner for such goods.

Rubber Rolls.

With this we give two illustrations of a patented rubber roll, manufactured by George P. Clark, Windsor Locks, Conn., used for wool washing, warp dyeing, yarn and skein dyeing, for acid processes, as well as for use in bleacheries, print works, etc.

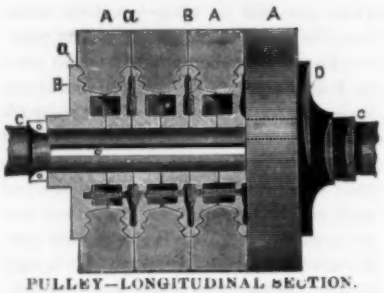
These are extensively used in wool scouring machines, taking the place of iron rolls covered with roping. They exert a superior evenness of pressure, and make a saving in time, labor and expense. They have great depth of rubber and elasticity; consequently, any wool scouring machine equipped with them will give dry wool with very little pressure. In this way they are a great saving in wear and tear of machinery. For warp dyeing machines it is claimed that they possess great advantages over the common wooden roll covered with burlap, which needs to be frequently removed.

In acid work in carbonizing, they work most satisfactorily, the covering not being affected by any acid solution.

These rolls meet a large demand among manufacturers for rolls that will withstand heavy pressure and wring goods dry without crushing the rubber from the roll. They are adapted to pressing water or liquid from any description of goods.

Their construction consists in having each section separately compressed and held between metallic

VIEW IN PERSPECTIVE O. COMPLETE ROLL.



PULLEY—LONGITUDINAL SECTION.

disks, whereby the density of the roller is more uniform throughout; and its consequent capacity to better resist the abrasion and wear to which its surface will, in use, be subjected, is said to be greatly increased over what it is practicable to accomplish when each section is placed upon the shaft without having been previously condensed, and the whole series of sections are compressed at the same time between the two end flanges of the roller.

—From Tiflis it is reported that the Russian Government contemplates shortly to establish trial stations in Transcaucasia, Transcaspia, and Turkestan for the further raising of the cultivation of cotton.

—If in the future the people of China are enriched by a development of the resources of their country it may be expected that woolens will be one of the first things on which they will spend their money.

KNITTING DEPARTMENT.

The Knit Goods Situation.

Decided activity prevails in most lines of knit goods. Several underwear salesmen have taken nearly double their usual amount of September orders. It remains to be seen if the orders have been rushed in ahead of time, in which case little gain will be made, or are to be scattered along as an excess demand.

Underwear importers, too, are doing a large business. Stocks are inadequate which form the strongest factor in the situation.

Fleeces of cotton composition fall far short of the demand. This is a case where the evil of overselling production is strongly brought out. The mass of manufacturers will not exert themselves to hurry heavy weight goods ordered seven or eight months ago, on which there is only a microscopic profit. What is worse, there is no prospect of the supply being materially increased for a long time.

Imported hosiery is fully as active as imported underwear, although there is much quibbling over prices. The tendency, however, is upward, although no great advance can be expected. Foreign advices indicate that fancies owing to the infusion of choice novelties have taken another lease of life. Large dotted goods are extremely popular, also embroidered styles and delicate stripes with grays, blues and purples for backgrounds, particularly in boot patterns.

The worst feature of the underwear business, just now, is the low prices prevailing. Taken altogether, it is no wonder that spring business has gone off with a rush, for little attempt was made to better the prices of last year, even where new lines were put out. Buyers have merely taken advantage of the weak-kneed condition of manufacturers and bought liberally whenever the right opportunity offered. Consequently the whole production of some mills has been taken and many lines entirely withdrawn.

Every month shows an improvement in the domestic fancy seamless productions which come into competition with foreign full fashioned goods. Wide clockings are growing more numerous, also silk embroidered styles with iridescent shades. In Chemnitz extracted goods are in such request that designs are now being copyrighted. Lace hosiery continues to be in striking demand. It is well to fight shy of several deep shades of purple and royal blue that are extremely attractive at first, but are far from fast. Fine German staples are in healthy condition as no stocks are allowed to accumulate and in the case of certain popular brands deliveries are now being dated after new year's.

In golf hosiery the situation is beginning to adjust itself. Already changes are being made, looking forward to restricted importation and manufacture.

Mercerized cotton hosiery is being so introduced that it cannot be ignored in the situation, although it will not cut much of a figure for a long time to come, at best. These goods are made in jacquard patterns with large effects that appear to better advantage than might be expected. Many have vertical stripes in lace and various set patterns with color effects introduced.

French combination checks and plaids (many in large patterns where light colors are used), are swiftly coming to the front.

In the embroidered line, lisle goods are conspicuous, vari-colored clocks being combined to match with stripes on the instep.

It is the general opinion that the average of the new samples of underwear is higher than for several sea-

sons, especially in fancy balbriggans. The patterns, too, have improved as much as the composition of the goods.

More attempt is wisely being made to produce desirable medium weights as has long been the case abroad. These between-seasons lines are sure to develop slowly but surely.

Mercerized underwear with its silky feel is beginning to be widely shown in plain and fancy colors, and eventually will have to be reckoned with.

Knitting in the West of England.

The Midlands have been the seat of the knitting industry for years past; Nottinghamshire, Derbyshire and Leicestershire always being largely associated with the manufacture of hosiery from the earliest period of mechanical knitting, and many, who have not turned their attention to other parts of the British Isles, will be surprised to know that machine knitting is carried on in a more or less degree in all quarters of the Isles. One does not, however, expect to find the large factories with their modern machinery, such as are to be found in the Midlands, though not a few of these may be found in various districts, but the smaller machines of the circular and flat knitting machine type, are to be found far and wide, and even in the most unlikely spots. In a visit to the west of England, then, a hosiery factory must not be unlooked for. The first and last of these being that of the West of England Knitting Company, at Penzance.

A visitor in the direction of Land's End, cannot, when nearing the end of his journey, fail to notice the number of men who are employed in the fishing industry, the majority of which wear their specialty of blue fisherman's jerseys, and should the visitor be interested in the knitting industry, the question at once comes to the front as to how and where such jerseys are manufactured, for in such remote places as Newlyn, St. Ives, and other western villages, quite a large trade must be done in such garments. The practical man, however, notes that of the number of jerseys he sees, very few are made the same pattern, some most artistic combination of plain, ribbed and tuck stitches being noticed. The inquirer soon finds out that nearly the whole of these are hand knitted by the daughters, wife or mother of the wearer, who each vie with the other to make a neat and attractive garment, and one that will wear, for only the very best of blue worsted yarns are used up to 3/6 per lb., and not many garments would weigh far short of two pounds, so that cost cannot be their first study, as is inclined to be the case in those manufacturing districts where quantity gives way to quality. In spite of the fact that so many jerseys are knitted by hand, and knowing that a hosiery factory exists at Penzance, it would be expected that not a few of such garments would be made there for those who did not wear the hand knitted garments, but a visit to this first and last knitting factory shows this was not the case. On arriving at Penzance, one soon sees this is not so old a town as the surrounding villages mentioned.

About the year 1300, only a few fishermen's huts, and a chapel dedicated to St. Anthony, was the then existing Penzance, or Pensans from the old Cornish dialect, Pen, which signifies head, and sans, holy. St. Anthony was held in great veneration by these Cornish fishermen. In 1332, a weekly market was established, and it became a market town, and in 1512, it had become a trading port, with its defenses. It was near here, at Newlyn, that the Spanish force landed in 1595, and burnt that village, Penzance, Mousehole, and Paul, to the ground, causing the inhabitants to flee. Penzance, however, soon revived, and has to the present day been one of the most business towns of Cornwall. But arriving in the main street of the town, and making inquiries, we find the West of England Knitting Company's works near.

where some 50 hands are employed not in the sole manufacture of knitted jerseys for the fishermen, as might be anticipated, but making the ordinary class of ribbed seamless stockings, socks, etc., as are usually made on the circular flat knitting machines, the same being finished in the usual way, tied up, papered, and exported to more eastern and northern towns, to the wholesale merchant. One specialty of this firm which attracts attention is the fine ribbed fabrics for vests, and similar garments, made in pure silk, in quite a number of designs, which for taste in design and coloring are quite unique.

Leaving Penzance, not very far eastward, at Camborne, is found another small knitting factory, where a few machines are at work manufacturing stockings, socks, etc., which are principally being sold to the shopkeepers in the villages round. Here, no regard was paid to cheapness, the very best qualities of yarns being used. Girls' ribbed hose at 13/- for 2's being a standard quality, and these in the medium gauge makes. Another few machines at a village near by were making goods which were being sold in the various markets of the mining villages of Cornwall.

In Devonshire are some very large firms of merchants, some employing a few knitting machines for various specialties, but a specialty in some of these is the making of hand knitted fishermen's jerseys. One firm employing some 2,000 hands, who take out the yarn and hand knit these garments at a price each. Quite a number of shopkeepers can be found in this country who have a few machines of various kinds, who employ hands knitting all kinds of specialties and who claim to be hosiery manufacturers, making all kinds of knitted garments to order.—The Knitters' Circular.

—A large part of the American army, in the early years of the 1776 war, was clad chiefly in linen, and the hardships of winter campaigns were greatly intensified by that fact.

A Knitting Machine Improvement.

Improvements have recently been made the subject of a patent in this country, as the invention of an Englishman, residing at Leicester, referring particularly to knitting machines which have two needle beds co-acting. The purpose of these improvements is to dispense with the pivots, moving cam-plates, carriers, springs, elastic bands, and such like devices now employed to retain or hold webbers in the slideways of the comb of the needle-bed; also, to dispense with the dial-posts, lugs, retarders, and such like devices now employed to normally maintain the fixed relation of the fixed needle-beds; also, to dispense with the weights, rollers, and such like devices now employed to normally hold rib fabric in knitting position and to impart a piercing action to carry free staple to the back of the fabric, obtaining a self-retaining slidable webber device operable from the bed-face and a more elastic and smoother-faced fabric than heretofore.

A Better Grade of Knit Goods.

That the manufacturers of knit underwear in this country must now turn their attention to a more extensive production of the finer and higher grade of goods, is today very generally conceded. By the fact that so many million dollars' worth of the finer grades of goods are annually imported into this country, we are forcibly reminded that there is a large and comparatively undeveloped field for the production of more elaborate styles and grades of underwear, for which we have to pay to foreign countries.

We can point with pride and satisfaction to the marked and undoubted excellence of our improved knitting machinery which is now so freely used and exported to foreign countries, as the past year's statistics show. And while our ingenious mechanics can manufacture such elegant machines, there is no need of saying we cannot produce as fine and as high grades of yarn, equal to the very best mills in either Germany, France, or

Great Britain. But nevertheless so long as we do import such large quantities of foreign made goods of finer qualities, we cannot escape from the stigma we often hear referred to. "We cannot do it"; or, as the Scotchman would say, "Ye canna did."

This is a reflection upon us, as a manufacturing country. But I freely say, it can be done, and no stone should be left unturned, and no effort relaxed, so long as this enormous quantity of underwear comes to us from foreign countries. I know of no reason why our American manufacturers cannot produce every style, grade and even finer qualities of underwear, equal in every respect to the best artistic work of either Great Britain or any country in Europe.

The ability to produce such goods cannot, of course, be acquired all at once. Careful study and practical experience is required, with unremitting vigilance. The adoption of all the latest improvements in machinery and methods are among the first requirements; and I would say, and claim, that knitting is to be classed among the fine arts, based on scientific principles, the knowledge of which cannot be secured by amateurs, or by an uneducated workman, but only and exclusively by thoroughly intelligent and scientific study. The enterprise, energy and inventive genius of our American mechanics will, most assuredly, in the near future, enable the manufacturers of this country to place upon the market beautiful and artistic designs, and superior goods, in competition with and to the total extinction of the underwear now imported from abroad, which represents such a vast amount of money that should be usefully and profitably employed in our own country.

The manufacturer must keep this in view: He must have intelligent and skillful management at the head of each department, with the very latest and best improved machinery, with well trained, careful and attentive operatives.

With all these advantages, they will avail him nothing, unless there is a most thorough system adopted, I may say, from cellar to attic, with constant watching. This I learn the need of more and more daily, as I am called upon to go from place to place, as I have been doing the past few years.

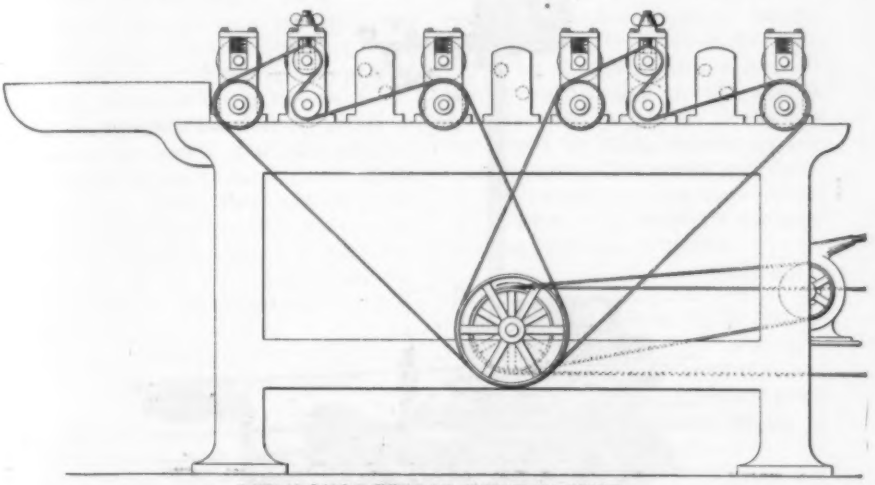
Beside the above, there are certain clearly defined principles which should not be deviated from. For instance, to produce a number one article, the stock, either wool, cotton or anything else, should not fall below the necessary standard, if the best results are to be expected; for any mistake made in buying the raw material cannot afterwards be rectified. So it is necessary to examine carefully every bale of wool, cotton, etc., that enters the mill. The cotton should be as uniform in quality as can be found, the wool, also, as to grade, or otherwise we destroy the foundation upon which it is possible to produce a uniform thread. The cotton staple, for example, must be as near equal in length as possible, to insure the best results, and the greatest economy. It is safer to purchase cotton a shade higher, for the manufacturing of fine goods, rather than a shade lower. The strictest attention should be given to this matter, for good, even-running stock is the foundation of the business, and when purchasing the raw material this, as a leading principle, should be kept in mind. Batching, for fine work, is of the greatest importance to make it as large as possible, for the variation in the different bales is often considerable. I have been obliged this season, more than ever before, where I have been engaged on fine work, to discard many bales when opened. And from other manufacturers I learn that they have had the same trouble this year, more than common. Unless cotton is mixed in large lots, it is difficult to make a yarn of uniform quality. Where the picking room is small, open no less than eight or ten bales at once before picking, examining the same, taking an equal quantity from each bale as long as they hold out. The yarn from this process will be as uniform as it is practicable to make it, and the extra

cost of careful mixing is more than compensated for in the quality and product. And I freely say, one-half of the battle is fought in the picking and mixing room. I repeat, good stock, well prepared, is of the greatest importance, and the necessity of which cannot be questioned; and to those that drag in one bale at a time into a picking room—don't do it any longer. I know many who do it.

A. SCOTLAND.

The operation is very rapid, so that the best results may be produced. As the necessary consequence of this the output of the machine is very large, and therefore the work is economically performed.

Making some reference to the particulars of the operation, it may be remarked that the goods are boarded and then run through the machine on the boards. Where fast blacks are treated, and particularly oxidized blacks, the goods are singed and finished in the green. A developed black can be finished in the white, as also can tans and other colors. The reason why it is preferable to finish blacks in the green is because, if they are finished in the white, the oxidizing process would create another nap in place of that which has been removed.



PEEL'S LISLE THREAD FINISH MACHINE.

Lisle Thread Finish on Cotton Hosiery.

We present, herewith, a new machine made by Samuel H. Peel of the Wakefield Mills, Fisher's Lane, Germantown, Philadelphia, for putting a lisle thread finish on cotton hosiery.

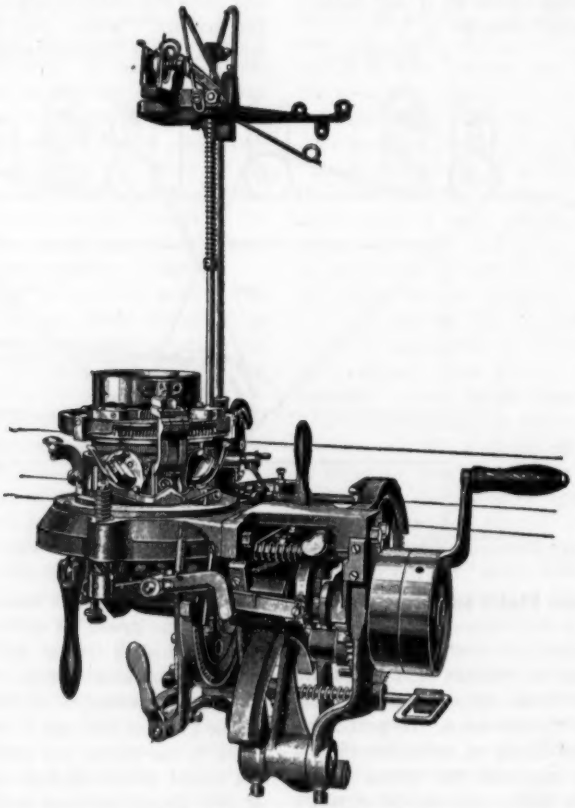
In this machine the brushes and rollers are driven on one side while gas is introduced on the other with a small blower, in order to produce a blue flame.

It will not be necessary to give a technical description of this apparatus, the nature of which is indicated in some degree by the drawing. It may be said, however, that various devices connected with the machine produce perfect combustion. The combustion also is uniform throughout the whole length of the pipes, which will be perceived to be a matter of very high importance.

The best practice is that after the goods are oxidized they are boarded, using either the regular board or ordinary dye house boards. They are then run once through the machine, stripped and chromed in the usual way. The cost of this is about 1½ cents per dozen, including gas and labor. The expense of finishing other shades is about the same. A small boy can easily operate the machine and successfully treat from forty to sixty dozen per hour.

This machine is now ready for the

market and hosiery manufacturers should look into its merits and put themselves into communication with Mr. Peel at the above address and procure from him the conclusive demonstration, which he can supply, that all the claims he makes for the apparatus can be fully substantiated in practical operation.



BRANSON'S 7-8 AUTOMATIC.

Branson's Knitting Machine.

The Branson Machine Co. are building a 7/8 automatic machine (more properly called 15/16 automatic) which as usual with machines produced by this company, has been very carefully tested and very thoroughly tried in the hope of eliminating every weakness before the machine was offered for sale. They offer this machine to the public with the same confidence in its merits and future success that they offered their 3/4 automatic machine in 1894, and which kept this company running night and day for nearly two years. The fact that the Branson Machine Co. have sold their first lot of machines without advertising them, beyond an invitation to the nearby manufacturers to call and see them, is pretty good evidence that the manufacturers who see the machines are pleased with them. The operator is only required to go to the machine twice during the knitting.

One operator will run five to nine of the 15/16 automatic machines on half hose and will run twelve to twenty machines on string work. The price is the same as the 3/4 automatic machine. It operates with one belt. Upon completion of the heel and toe, it cuts out the splicing thread, and, without stop or alteration, carries

down the inoperative needles and starts upon the circular work. It makes a gradual and automatic change of the stitch in the ankle of ladies' hose. The builders claim it is built heavier and stronger where weight and strength are required than any machine offered to the public. It has a slight alteration in the picking device, which makes it most satisfactory for factory use. It is built under full authority from the owner of a pioneer patent for picking device, and it has been the aim of the builders to embody all the improvements which their experience, inventions and patents have made possible up to date.

The company has recently added an exhibition room to their office and factory, 506 N. American St. (formerly St. John St.), where they have the machine on exhibition, and where they are at all times pleased to see their old friends and customers or any one interested in the manufacture of hosiery.

A Magnetized Rib Frame.

The subject of this will no doubt strike a good many as being peculiar, and so the writer found, and aside from that it was rather expensive, to say the least. The above happened to a Britton & Denny 4¼ inch children's rib frame, and was as follows: For some time past the frame had been giving trouble, dropping stitches in spite of all our machinists could do. It had been taken to pieces two or three times, every part examined, new cams put in the dial with no better result, and finally we gave it up, and laid the frame aside.

About a week later, needing this machine very badly, we got at it again, and upon careful investigation, discovered that the slower the speed, the more it dropped stitches. This seemed peculiar and the mystery seemed deeper than ever. But at this junction our trouble was solved. As the writer was standing looking at the frame with the carrier directly in front of him, the dial needles extending out from the carrier, latches properly opened, he noticed the latch jump up against the carrier. That looked funny. He took a needle and shoved it back with the same result, and in a moment he knew the whole trouble was caused by the carrier being magnetized. He took this carrier off and found that it had the power to lift the end of a needle. How it became so, he cannot tell, as he found no other part of the machine affected this way. The dropped stitch was caused as follows: When the dial needles were shoved out to receive the thread, the magnetism in the carrier attracted the latch, and lifted the latter against the bottom of carrier, and as the needles traveled back, the bottom of the carrier closed the latch, thereby causing a drop stitch. This carrier was taken off and heated to a red heat, cooled and polished, replaced, and it has been working perfectly ever since.

WILLARD.

—When a woolen fabric is printed with zinc chloride at 200° Tw., and subsequently steamed, the printed portions contract, and the unprinted parts become wrinkled, thus producing a crepon effect.

—The government of the South African Republic, being desirous of establishing factories for the production of textile goods, in order to work up the large native produce of sheep's wool in its own country, and to be able to cover its requirements of clothing material without the help of foreign importations, has granted to a German residing in the Transvaal the privilege of being allowed to produce woolen stuffs for the next thirty years in the country, with a profit secured, to a certain extent, by protective duties.

—On June 30, 1898, there were 94 railroads in the United States in the hands of receivers, which operated a mileage of 12,744.95 miles, the mileage owned by these roads being 9,761.08 miles. As compared with the year preceding, these figures show a net decrease of 6,116.73 miles in mileage operated, and of 5,133.49 miles in mileage owned.

SILK DEPARTMENT.

Preparing for Broad Silk Weaving.

The operation of dyeing changes the raw or hard silk into soft silk. The next operation being winding, the object is to transfer the silk from the skein to spools so as to have a convenient method of transferring the silk to the loom beams, shuttle quills, or spools. The machine used for this purpose is known as a soft silk winder. The operative, always a woman or girl, is called a soft-silk winder.

The skein of silk is placed upon a swift, the end found, and attached to a spool placed on a spindle, resting in brackets over and in mechanical connection with a rotating pulley on a shaft. The thread is placed in a porcelain or glass guide secured on a rail, provided with a traverse motion. As each bobbin is filled, or has a sufficient quantity of silk, a new spool is supplied.

The operative's duty consists in placing the skeins on the swifts, changing the spools and maintaining a connection between the swifts and spools.

This operation, though not calling for any great degree of expertness to accomplish, is greatly facilitated if the operative is endowed with or has acquired a deftness of touch and skill, and the producing capacity of the machine and earning powers of the winders (operatives) are greatly enhanced.

The present method is to pay the operative by the piece, or so much per pound. The operative receives her silk in a bundle, with instructions, takes one skein at a time, and untwists the skein and opens it out, placing it upon the proper swift, finds the end which has been attached to a cord at the last operation of silk throwing, connects it to the spool and places the spool in connection with its actuating mechanism.

The number of ends a winder can attend to depends upon her experience and ability; for, though there ought not to be any breakage of thread in the skein, it often happens otherwise, and the finding of the broken end requires some skill to prevent waste, and to save time.

While a winding machine is simple in its several parts and construction, consisting of a frame, shafts and a series of pulleys, brackets, rails, swifts and spindles, all operated at the same time, the work to be done thereon can be greatly facilitated, both during the actual operation and for after manipulation, if careful attention is given to it.

If the adhesion of spool and pulley is nicely adjusted, and the silk becomes caught in the skein, the spool will be held stationary until the operative has time to remedy the trouble.

If the spindle head slips, a little powdered resin sprinkled on the pulley will improve things, and if the head bites too freely, a little French chalk, or Spanish whiting, will ease it. Similar remedies in connection with the running of the swift will often prevail.

A careless winder will often drop pieces of silk cut from knots, to be caught by running threads and carried around spool, or caught by parts of the swift or on some part of operating mechanism, causing trouble.

A winder, during the act of placing the spool and spindle in brackets, or picking broken ends from spools, will often touch the guide bracket, and move it slightly from its desired position, sufficiently to produce defective spools.

While the winding master cannot examine each spool separately, an occasional examination of the frames will often prove beneficial. There are, or ought to be, on all winding frames, and in connection with each spool, a device which, when the spool has received a proper amount of silk, will cause it to be raised from contact with its actuating mechanism.

In this connection silk manufacturing differs from all other manufacturing. The cost of the raw material, diversity of colors called for, and the small lots often used, require much ability on the part of the winding master.

The winder master should know the capabilities of his hands and frames; to be able to put through "hurry" orders with the least delay to regular work and to give each winder her share of indifferent working silk.

JOHN.

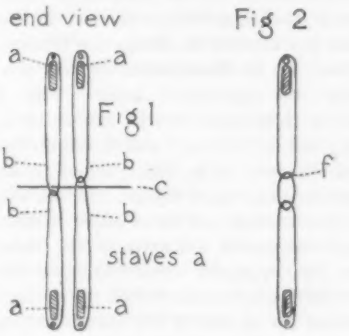
Plain Harness for Broad Silks.

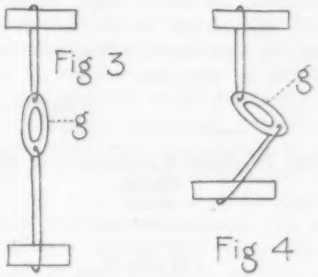
The term "harness" is used in silk manufacturing to designate the healds as used for cotton and wool, and are classified as French, English and Jacquard. The French is used for very fine counts, their construction being without knots or eyes, as illustrated in Fig. 1; the warp c being passed between the two joinings of the loops, b, b, b, b. These loops in reality form the eyes. It is obvious that a large number of threads to the inch can be woven with this description of harness without encountering an undesirable warp friction on the harness.

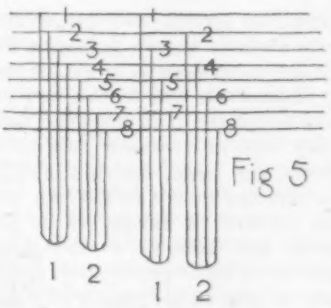
The English harness is of the usual heddle construction, each eye being formed by means of a knot f Fig. 2.

The jacquard harness is formed with a metal eye g, termed mail, Fig. 3.

It is not very many years since the mail g, was adopted to form the eye in plain or shaft harness. In several mills they are discarded, as, unless great care is exercised and only good quality of mails are used, considerable trouble is caused by defective mails, which in jacquard harness are replaced without much trouble, but, in shaft harness requires some small skill to replace perfectly. Another objection is that they are apt to make smashes and break the warp without any visible cause, particularly in cam shedding motions, which allow







a loose movement in the harness, in the extreme of their action; but with all shedding motions, in which the harness has a continued pull exerted, as with springs, the mail harness works very successfully.

To make this matter better under-

stood Fig. 4 shows the position assumed by the mails for an instant, causing them to become entangled in the warp threads, so that the latter get broken.

The entering or drawing in of the warp into the harness is a matter to be considered for the purpose of making a good covered satin, and to enable the weaver to obtain the best results. As an illustration we will consider an eight-shaft satin. Fig. 5 shows how many warps are entered, viz., 1, 2, 3, 4, 5, 6, 7 and 8, which for four threads in a dent, would make two dents to each repeat. If the 4th or 5th threads, or both, were broken out, and being redrawn in the reed, the weaver would require to count the threads to ascertain which dents they should go in, but if the harness were drawn in 1, 3, 5, 7, 2, 4, 6, 8, each repeat, from back to front, would be one dent, the warp would be spread more and would weave better, and make a nicer satin. This rule holds good in all weaving.

CAMPBELL.

The Practical Manufacture of Silk Goods.

DOUGLASS ELLIS.

ARTICLE II.

(Copyright.)

There is perhaps no class of spun yarns where a buyer's judgment may so easily be at fault as in the purchasing of spun silk, and for this very reason I would say in all cases first make a fair trial of a sample bale before placing any larger contract, and before ordering even a bale it is a good plan to have a sample skein submitted and examine it thoroughly, both as to its evenness and cleanliness, as well as the length of staple. The following will be found a very good method of testing a new grade of either spun silk or any other short fibred yarn: Take a spool of silk of which you are using, and the weaving qualities of which there is no doubt about and twist a single thread of your new sample from 12 to 20 times around a single thread of your own silk, and then get your office boy or any one else available to play a little game of "see-saw" with you upon these two threads and keep on rubbing them one across the other until one wears out, which will not take very long. By repeating this simple process a few times we soon begin to see which thread can stand the most friction and the thread which will stand the greatest amount of friction, other conditions being equal, is the yarn we are looking for to use for warp.

I would say to anyone who has the time and opportunity to make a few experiments upon spun silk in the above manner, to make a careful examination of the threads, during the process of chafing, through a good large counting glass. It will prove both very interesting and instructive. Of course, in making these tests, both the size of the thread and the amount of twist it contains ought to be the same or as near as possible, and also in see-sawing them one across the other, we must try and keep both threads at about the same tension all the time, because if we hold one tight and the other slack the test will not be a fair one.

Now supposing that we have succeeded in obtaining a really first-class article for warps, we must not sit quietly down and assure ourselves that all our troubles are over; far from it, they are only just commenced. We occasionally find that out of one lot of silk which has been dyed up, we will suppose into a dozen different shades, that one or two colors will weave much worse than the rest and in some instances will rub up rough behind the reed, and still all the rest of the warps be running first-rate. To find a reasonable explanation for this is often a very difficult matter, but if we can succeed in tracing it we shall very probably find that these bad warps are a little off shade when they come

out of the dry room and are sent back into the dyehouse and again treated to a hot bath, which is at all times more or less detrimental to silk. Another thing to be borne in mind is that most spun silk dyers use what is known as a stretcher upon which they place the skeins of silk after being dyed, in order to raise the lustre and make it look nice and bright. This stretching machine is simply two hard wooden pins, some three inches or four inches thick, upon which the skeins are placed a few at a time, and then the bottom pin is drawn down tight by a worm gear and the exact amount of stretch to which our silk is submitted by this stretching process is usually left to the judgment of the operator, who is generally one of the laborers in the dyehouse and whose judgment as to the correct amount of stretch the silk will stand without being injured is not at all times very reliable. Should the skeins not be spread evenly upon the pins, the tight places will, of course, get the greater amount of stretch, and may very possibly be more or less damaged. When it happens that we have to return a lot for being "off shade," and it has to go once more through the several operations of the dyehouse, we may reasonably expect some extra trouble both in the winding and weaving of this particular lot. Under certain conditions a silk warp is very apt to be badly chafed in the process of weaving if the loom has not been properly fixed; but upon this subject we shall treat at length in its proper order.

In sending our silk to the dyers we must at all times be careful to dye enough to make our warp the desired length, and still have as little as possible left over when the operation is completed, so that in figuring out the exact weight we require it will be found to be a very good plan to make a separate calculation of how many skeins we require to make our warp and by so doing we can at all times check off our scale weight by the actual number of yards we have got in any given lot. We shall also find that our silk does not come out exact to scale weight. Some spinners usually make their yarns come out a trifle on the heavy side, while others, again, spin a shade on the fine side. If we find, on making a proper test, that our silk is within two per cent. on either side of the size that it is represented to be, we may be satisfied that we are being fairly treated, and if our silk is from a good reliable firm we shall find it to come out about the same all the time.

Another important point to be borne in mind when we send the silk to the dyers, is to give them, at all times, (where it is possible to do so) a good sized sample shade to match, and of the same kind of silk that we are sending them to dye.

In the laying out of the silk to be dyed for current orders, we must not be too close in our calculations, as there is nothing more annoying than to find, when we get a warp almost finished on our warping mill, that we have not got quite enough silk to finish it, and that it will be necessary to dye another small lot before the warp can be completed. This slight error is very easy for any one to make and at times proves to be a very costly one, as it often happens that the small lot does not receive the same treatment which was given to the first one, and although we may pass it at the time as being a very good match and think that it will never be noticed, it is not at all unlikely that we may have these same lots of goods shown to us in New York some weeks later, and we find to our dismay that the two lots of silk have each faded a little, as is usually the case, only, in this particular instance, the small lot which was such a good match at the mill, has faded altogether different from the remainder of the goods; and so we have a stripe down one side of a different shade from the rest of the fabric, and we must make quite a substantial allowance upon these goods on this account, and it is more than likely that the amount will be far more than the original cost of the silk warp, so that under these circumstances it is very poor economy to try

and save a few ounces of silk in the making of warps.

In any case, where we are using spun silk from a new firm it will be found a very good plan to make several tests of it on a proper "reel" while the lot is being wound, and if we have any suspicion at all that the lot is going to run at all short in length, the best plan is to shorten the length of our warping order by a few yards so as to insure our being able to complete it with the dyed silk we have got on hand, and the reduction of two or three yards in the length of a warp is not likely to cause any comment, only we shall have so much extra filling left on hand if the filling has already been dyed.

Another way of getting round this same error can also be adopted at times to advantage. If we find that our silk is not going to finish our warp which is already three parts made on the mill, let the warper go ahead and finish it as near as he can and then beam it at once so as to relieve the warping mill for other work and have our extra silk dyed, and when we are ready to make the remainder of our warp put it on to another beam either in one wide stripe in the centre of the beam or divide into several small ones the width of the original warp. Then take the two beams and fix them into either a dressing frame or a warp picking frame and beam the two both upon one beam and have the added ends so distributed along with the rest of the original lot that they cannot possibly be detected. In this blending of the two lots we should have some regard to the nature of the weave we are going to have and so arrange it that the colors will be well blended when weaving. For example, if we are going to use the warp on a plain canvas weave we must not mix our silk end and end, because if we do we shall first have all of one lot and then all of the other showing on the face of the goods alternately.

Another important point to be borne in mind at this time is the winding of our silk upon a proper number of spools so as to best suit the requirements of the warper and thus enable him or her to get through their part of the work in as short a time as possible and in this particular it is necessary at all times to exercise our very best judgment. Suppose that our bank or creel contains 500 spindles, it is, of course, the quickest way for the warper to have a "full bank," as it is termed, and keep right along repeating with these 500 ends until the desired number have been obtained for the warp. This method answers first-rate in cases where we have an unlimited supply of silk to work with, as is the case in some silk mills where they use principally black warps for dress and tie silks. But where we are using spun silk for tapestry, or similar fabrics, where there is such an endless variety of colors that we seldom have two warps the same shade to make at one time, we shall have to arrange to have our silk wound two or three skeins upon a spool so as to fill up the warper's "bank" as near as possible, and at the same time contain sufficient length to run out the warp as near as we can.

There can be no golden rule laid down for the best course to pursue in the above practice, as different mills require different methods and the best plan to suit the case must at all times rest in the judgment of the man in charge. It may also be well to bear in mind that it is a very easy matter to shorten the time required for making a warp by several hours, if we have given due care and attention to the winding of the spools.

It must be also further noted that if it becomes necessary for a warper to reduce the number of his spools to only a few, toward the finish of his warp, that it not only occupies considerable more time to complete the operation, but that it also makes more or less difference in the tension of the warp ends, and may possibly cause a streaky appearance in our goods when woven.

Organzine Spinner.

A resident of Paterson, N. J., has recently invented certain improvements for the spinning of organzine warp, the principal object of which is to improve the mounting arrangement of the spindles for the delivery of bobbins.

Rearing Silkworms in Lombardy.

The method of rearing silkworms is about the same throughout Lombardy, and only varies in some particulars, according to the ideas of different culturists or as they follow out the theories of certain writers or inventors in an effort to improve upon present practices.

To describe and also to understand this, nature's most marvelous machine for converting the leaf of the mulberry tree into the finest threads of silk, it is necessary to bear in mind that it is a work of detail; that in each stage, each period of which in the development from the tiny egg through the various stages until the moth is produced, the greatest care, the most constant watchfulness, and perhaps, above all, a real love for the work is required. To be sure the worm is only the machine, but one of such delicate organism as to require the most careful hand to guide it to a perfect result, and this care is most generously bestowed by the Italian peasants, who regard a failure in any way as an ill omen for the remainder of the year.

To begin with the eggs. If they are bought, it is absolutely necessary, in order to meet with good results, to obtain only such as have been laid by moths free from disease, with no hereditary taint, and, to insure this, to buy only from breeders or dealers who have a reputation for the quality of their eggs. If one raises his own eggs, it is no less necessary to take all precaution against disease. The method of doing this will be described later on.

The eggs, if kept until the time for hatching in the same temperature in which they are laid, will spoil, and so they must be regularly subjected to the various temperatures of the year. They can bear the heat of the summer months, but must be protected from the sun, and as the autumn passes and the temperature becomes lower they are allowed to cool, but from this time on any sudden rise in the temperature must be guarded against, especially when the season approaches for their hatching; through it all they must have plenty of air.

The eggs must now be kept cool, and there are several ways of keeping them so, each method having its advocate. Some keep them in the Alps from December until March, which is said to be a very good plan, but the keeping them in cellars, although it is cool, is bad on account of the dampness.

The dry, airy room, so located and supplied with such means of ventilation that the temperature can be kept down and regulated as needed, is a favorite method. Then there are portable boxes manufactured, capable of holding about 100 ounces of eggs each, although there is no cast-iron rule in regard to size, in which the temperature can be kept down by a simple means of refrigeration. These boxes or chests are simply refrigerators properly ventilated and with shelves on which the sheets of paper or cloth that hold the eggs are placed. It is necessary to protect the eggs from the mice, which seem to have an especial fondness for them, and some do this by placing them in small cupboards covered with perforated zinc.

The old-time method, long since abandoned, was to hatch the worms by body heat, putting the eggs between mattresses, for example, or as many Italian peasants practiced, by carrying them, of course covered, in the bosom. It was considered a particularly good omen to wear them in this way to church.

It may be asked why not wait for the natural birth of the worms; but it must be remembered that to do this would place the silk culturist in too

seed, and by a slight crackling noise helpless a position; that nature, caring more for the preservation of the species than for that of the individual, places impediments to a too great production, while man, desirous of making the most of the individual, at the same time, of course, taking care to preserve and improve, if possible, the species, so regulates the birth that as far as possible he may guard against the caprices of a season. In short, to leave the eggs exposed to the natural spring temperature is too uncertain, for the birth might come too early or too late, and thus cause all the labor of a season to be wasted.

The time for hatching is regulated by the advancement of the season and the growth of the mulberry leaves, for unripe leaves lack the nutritive properties and overripe ones are apt to cause disease. When the season is normal, the hatching is about the first of May. As the time approaches for hatching, the eggs are brought from the preserving room, or wherever they have been kept during the winter, to the hatching room, which, by the way, must be thoroughly disinfected by chloride of lime or dilute sulphuric acid, and as the eggs have been kept during the winter at a temperature of about zero, or a little below, and as at this season clear, dry cold is not injurious, great care is taken not to subject them to a too sudden rise. The temperature should be slowly increased until by the middle of April it reaches 41 to 48° F., this, as before stated, depending upon the growth of the mulberry leaves. Then the temperature is steadily increased to 54.5° F. and kept at this point for three or four days, when it is increased 1° every twenty-four hours until 63.5° F. is reached, then once more increased until 68° F., where it is held for two days, then for the last time run up to 70 to 72.5° F., where it is held until the worms are hatched. The whole period requires about twenty-two days.

The birth is announced by the change in the color of the egg, which is smaller than a grain of mustard caused by the head of the tiny worm tapping upon the shell, which is quite hard, in its efforts to get out. The best birth comes early in the morning, those being hatched later in the day being kept separate from those hatched early that they may be fed enough to make them equal to the first.

Besides this hatching room there are several good incubators used, and they are considered to be more economical, the two best being, perhaps, those of Signor Orlander and Signor Cramer. In the former, the advantages are uniform heat, sufficient ventilation, a proper degree of moisture, and the utilization of all the heat and moisture produced by the alcohol. They are collected in a clay vessel, which transmits them in a purified state to the incubator. An electric thermometer is considered necessary to give the alarm when too great a degree of heat is reached. In short, all the incubators are on the same principle as those used in hatching chickens, of course adapted to this specific use.

Feeding Silk Worms.

The feeding of silk worms in Italy is regular and precise, the heat of the room governing the appetite, which increases with a rising temperature and requires a greater number of meals. The most suitable temperature is from 69° to 72.5° F., but if the keeper wishes to save two or three days in the rearing he brings the temperature up to 77° F. In the first stages, as before mentioned, they are fed every two hours, but afterwards once in three hours. Great cleanliness must be observed in feeding the worms, and different baskets must be used in carrying out the refuse and bedding and bringing in the food.

For the worms hatched from an ounce of eggs about 1924 to 2205 pounds of leaves are required, divided as follows: First stage, 9 to 11 pounds; second stage, from 24 to 33 pounds; third, from 88 to 110 pounds; fourth, from 274 to 330 pounds, and the fifth stage, from 1598 to 1720 pounds.

DYEING DEPARTMENT.

Dye Recipes for October.

The following recipes appear in the Dyers' Supplement, which is issued each month by the TEXTILE WORLD. The Supplement contains the colored samples, dyed according to recipes given. The selection of samples is carefully made, and it is the aim to show shades which are of especial interest to the dyer, and which the requirements of the market demand. The Dyers' Supplement is a 16 page pamphlet, in convenient form for preservation. Subscription price for the TEXTILE WORLD with the Dyers' Supplement is $3.

RECIPE NO. 145.

Reddish Orange on Cotton Yarn.

Diphenyl Chrysoine 2 R on 100 pounds of cotton yarn.

Prepare dye bath with

20 lbs. Common Salt.
2 lbs. Diphenyl Chrysoine 2 R.
(John J. Keller & Co., 104-106 Murray St., New York.)

Enter yarn at 180° F., bring to boil, and dye at this temperature for one hour with sufficient working to insure evenness.

Diphenyl Chrysoine 2 R produces an orange red shade which is very fast to washing and light. (See recipe No. 117, August issue.)

RECIPE NO. 146.

Blue on Cotton Yarn.

Erie Blue B X on 100 pounds of cotton yarn.

Prepare the dye bath with

2 lbs. Erie Blue B X.
(Berlin Aniline Works, 72 Front St., New York.)
3 oz. Glauber's Salt } per gal. of
½ oz. Soda Crystals } dye bath.

Dye at a boil for one hour, with sufficient working to insure evenness.

Erie Blue B X exhausts slowly and dyes evenly upon vegetable fibres, and yields full medium to dark blue shades, depending upon percentage. It possesses the advantage of greater fastness to alkalies and calendering than many direct blues of equal shade.

RECIPE NO. 147.

Brown on Cotton Yarn.

Pluto Brown R on 100 pounds of cotton yarn.

Prepare the dye bath with

4 lbs. Pluto Brown R.
(Farbenfabriken of Elberfeld Co., 40 Stone St., New York.)
40 lbs. Glauber's Salt.
1 lb. Soda Ash.

Dye for one hour at a boil, and work the goods for ¼ hour after the heat is removed from the bath.

Pluto Brown R, when used alone, gives a very rich shade of brown, but when developed, with Benzo Nitrol Developer paste, a faster and much darker shade is obtained.

RECIPE NO. 148.

Pink on Cotton Yarn.

Direct Pink on 100 pounds of cotton yarn.

Prepare dye bath with

3 oz. Direct Pink.
(O. S. Janney & Co., 8-10 Letitia St., Philadelphia, Pa.)
30 lbs. Common Salt.

Enter yarn at 140° F., turn while raising to a boil and continue the boiling for ¾ of an hour. Wash and dry.

The shade produced by this dye is extremely fast to washing and light, and will stand the laundry test without being impaired, and will not stain other colors or white when woven into stripes or checks. The quality makes it a desirable color for all grades of high-class work (see recipes Nos. 83, 107 and 124 for colors on cotton from other direct dyes sold by this house).

RECIPE NO. 149.

Navy Blue on Cotton Yarn.

Brilliant Direct Navy Blue R on 100 pounds of cotton yarn.

Prepare dye bath with

3 lbs. Brilliant Direct Navy Blue R.
(C. Bischoff & Co., 87 Park Place, New York.)
25 lbs. Common Salt.

Enter goods at 190° F., bring to a boil, and boil for one hour.

Brilliant Direct Navy Blue R has a very strong coloring power. It goes on the fibre evenly and has excellent penetrating properties.

RECIPE NO. 150.

Black on Worsted Yarn.

Phenylamine Black T on 100 pounds of worsted yarn.

Prepare dye bath with

10 lbs. Glauber's Salt.
6 lbs. Acetic Acid (33%).

Enter wool, boil 10 minutes, lift yarn, allow bath to cool a little, and add, previously dissolved,

5 lbs. Phenylamine Black T.
(Farbenfabriken of Elberfeld Co., 40 Stone St., New York.)

Boil ¾ hour, and then slowly add

2 lbs. Sulphuric Acid,

Continuing the boiling until the full shade is reached; then wash and dry.

Phenylamine Black T is a cheap dyestuff, and will be found of interest where cost must be considered.

RECIPE NO. 151.

Reddish Violet on Worsted Yarn.

Acid Violet 4 R on 100 lbs. of worsted yarn.

Prepare dye bath with

4 lbs. Sulphuric Acid.
20 lbs. Glauber's Salt.
2 lbs. Acid Violet 4 R.
(A. Klipstein & Co., 122 Pearl St., New York.)

Enter yarn at 140° F., bring slowly to a boil and dye at this temperature for at least one hour.

Acid Violet 4 R is an acid dyestuff, intended for silk or wool. It goes on the fibre slowly, thus insuring evenness and penetration, and is one of the fastest violets to light known.

RECIPE NO. 152.

Black on Worsted Yarn.

Soudan Black No. 2 on 100 pounds of worsted yarn.

Prepare bath with

10 lbs. Glauber's Salt.
5 lbs. Sulphuric Acid.
8 lbs. Soudan Black No. 2.
(Sykes & Street, 85 Water St., New York.)

Enter yarn at 140° F., bring to a boil while turning, and turn 1½ hours at that temperature.

The range of Soudan Blacks will be found to give excellent satisfaction to the dyer for their fastness and cheapness, and because they will combine with acid dyes for the production of deep shades. (See recipes 130, 152, 167, 172 and 192 in our 1897 supplements).

RECIPE NO. 153.

Brown on Cotton Yarn.

Compound shade on 100 pounds of cotton yarn.

Prepare the dye bath with

2 lbs. Thiocatechine No. 1.
¾ lb. Vidal Black Mercaptol.
(Sykes & Street, 85 Water St., New York.)
5 lbs. Common Salt.
5 lbs. Sal Soda.

Enter yarn at about 190° F., bring to a boil, and boil for one hour.

Fix for 20 minutes and at a temperature of 140° F., in a bath made up with

2½ lbs. Potassium Bichromate.
2½ lbs. Copper Sulphate.
5 lbs. Sulphuric Acid.

This shade, obtained in this way, is very fast to light, acid and soaping. (See recipes 115, 130 and 144 for other combination shades of brown.)

RECIPE NO. 154.

Cardinal Red on Worsted Yarn.

Wool Red B on 100 lbs. of worsted yarn.

Prepare dye bath with

3 lbs. Wool Red B.
(Wm. J. Matheson & Co., Ltd., 182 Front St., New York.)
10 lbs. Glauber's Salt.
5 lbs. Acetic Acid.

Enter yarn at about 120° F., raise to the boil within 20-25 minutes, and after having boiled ¾ hour add

5 lbs. Acetic Acid.

And when bath is exhausted add

1½ lbs. of Potassium Bichromate, and work 25 minutes longer at the boil.

This color produces effects which

are exceptionally fast to milling and fulling, and is also very fast to light, washing, acids, and other common reagents.

RECIPE NO. 155.

Black on Cotton Yarn.

Oregon Black on 100 pounds cotton yarn.

Prepare dye bath with

6 lbs. Oregon Black.
(Anchor Color Manufacturing Co., 462 Cherry St., New York City.)

25 lbs. Common Salt.

Enter yarn at boil, and turn one hour at that heat. Shut off steam and turn one-half hour longer, without steam being turned on. Rinse.

Oregon Black will also dye a fine shade on wool and cotton mixed goods, in one dip. It is also very well adapted for garment dyeing and for hosiery dyeing, as the color does not rub off.

RECIPE NO. 156.

Red on Cotton Yarn.

Chlorantine Red on 100 lbs. of cotton yarn.

Prepare dye bath with

3 lb. Chlorantine Red.
(A. Klipstein & Co., 122 Pearl St., New York.)

25 lbs. Common Salt.

Enter yarn at about 170° F., bring to boil, and dye at this temperature for at least one hour, with sufficient working to insure evenness.

Besides being useful in cotton dyeing, Chlorantine Red may also be used on cotton and wool mixes. It possesses superior qualities on account of its fastness to acids.

If the same bath is used a second time the amount of dyestuff may be diminished one-third. (See recipe 137, September, for a lilac on cotton from Chlorantine Lilac.)

RECIPE NO. 157.

Black on Worsted Yarn.

Anthracene Chrome Black 5 B on 100 pounds of worsted yarn.

Prepare dye bath with

5 lbs. Anthracene Chrome Black 5 B.
(Wm. J. Matheson & Co., Ltd., 182 Front St., New York.)

5 lbs. Acetic Acid.

Enter the yarn and work at a boil for ½ to ¾ of an hour.

Then lift the yarn, cool slightly by adding cold water, and add

7 to 8 lbs. Bisulphate of Soda

or

3 to 3½ lbs. of Sulphuric Acid.

Continue the boiling until the bath is exhausted, then add

1¼ to 1½ lbs. Bichromate of Potash

and boil ½ hour longer. Then wash and dry.

Anthracene Chrome Black 5 B produces black of a brownish tone, which is extremely fast to washing, light, milling, steaming, alkalies and acids. It stands carbonizing, which renders it suitable for dyeing loose wool. It dyes evenly and its penetration is excellent, thus rendering it valuable in the dyeing of heavy goods and felts. (See recipes Nos. 116 and 135 for blacks from other brands of this dye.)

RECIPE NO. 158.

Golden Yellow on Cotton Yarn.

Rhine Yellow on 100 lbs. of cotton yarn.

Prepare the dye bath with

1 lb. Rhine Yellow.
(O. S. Janney & Co., 8-10 Letitia St., Philadelphia, Pa.)

20 lbs. Common Salt.

Enter yarn at 180° F., turn while raising to the boil, and continue boiling for one hour. Wash and dry.

If the bath is used over, it only requires about two-thirds of the original amount of dyestuff to produce the same shade.

Rhine Yellow gives a full and pure gold and is fairly fast to light and washing. This dyestuff is also valuable as an orange; three to four pounds per hundred of goods giving a very fine shade of orange.

RECIPE NO. 159.

Blue on Cotton Yarn.

Diphenyl Blue B M on 100 pounds of cotton yarn.

Prepare dye bath with

3 lbs. Diphenyl Blue B M.
(John J. Keller & Co., 104-106 Murray St., New York.)
20 lbs. Common Salt.

Wring or pass through hydro-extractor, and dye in a bath of

12 lbs. Alizarine Garnet.
(Wm. Pickhardt & Kuttroff, 128 Duane St., New York.)
½ lb. 20% Ammonia.

Enter goods at ordinary temperature, gradually raising same to boiling, and finish the dyeing at this temperature.

The advantages of "Amend Mordanting Process" over the old method of mordanting with bichromate of potash and tartar or lactic acid are:

(1) But little heat is required, hence a great saving in steam.

(2) The process is shorter.

(3) The mordanted yarn is left in a better condition, since the boiling temperature of the older mordanting process is avoided.

(4) There is a saving in the dyestuff, i. e., the same depth of shade with a greater brilliancy can be produced with a lower percentage of dyestuff.

(5) The dyed goods are less liable to unevenness by this process than the old.

Enter yarn at 180°, bring to boil, and dye at this temperature for at least one hour, with sufficient stirring to insure evenness.

Diphenyl Blue B M goes on the fibre evenly, and produces a bright, handsome shade of blue.

RECIPE NO. 160.

Garnet on Worsted Yarn.

The Amend Mordanting Process (controlled by The Amend Process Co., 205-211 Third Ave., N. Y.) on 100 pounds worsted yarn.

Prepare bath for mordanting with

6 lbs. of Acetic Acid (30 per cent.).

Turn one-half hour at 140° F. Lift yarn and add

1 lb. of Chromic Acid (previously dissolved in water).

Turn for one-half hour, allowing temperature to fall.

Then lift and add to bath

6 lbs. of Bi-Sulphite of Soda.

Bring bath to 140° F. and turn for one-half hour at this temperature.

New Dyes.

We take pleasure in showing in this issue recipes in which appear a number of dyes that have already established for themselves an excellent record for meritorious qualities such as are called for in the dye house at the present time. Dyed samples showing colors here represented will be found in our Dyers' Supplement, to which we call the attention of manufacturers and dyers.

Berlin Aniline Works, New York, show in recipe 146 their Erie Blue B X for the production of a blue on cotton yarn. This dye possesses the advantage of great fastness to alkalies and calendering. It dies from a neutral or alkaline Glauber's salt, exhausts slowly, dyes evenly upon vegetable fibres and yields full medium to dark blue shades. This dye is little suited for wool and union material, while for half silk it is of interest, as it dyes the cotton and only slightly tints the silk.

Farbenfabriken of Elberfeld Co., New York, show in recipes 147 and 150 two of their comparatively new dyes—Pluto Brown R for a shade of brown on cotton yarn, and Phenylamine Black T for black on worsted yarn. We think dyers will be greatly pleased with the samples representing these two recipes and we direct attention to our dyers' comments regarding them. Phenylamine Black T is especially adapted for piece dyeing. There is another brand of this dye known as 4 B. These dyes possess excellent qualities for hat dyeing, and stand the various operations which such goods have to undergo. They are suited for slubbing printing.

O. S. Janney & Co., Philadelphia, show in recipes 148 and 158 two of their dyes—Direct Pink for the pro-

duction of a pink on cotton yarn, and Rhine Yellow for the production of a golden yellow on cotton yarn. Direct Pink is regarded as one of the fastest and best pinks that are to be had, as giving a very bright shade, either on gray or bleached cotton and possessing an exceedingly large amount of tinctorial power. The pink produced is quite fast to light and washing and will not bleed into white in striped goods and will stand the laundry test. Rhine Yellow is a good rich yellow with a reddish cast and dyes a shade which is as fast to light and washing as the average salt dyes and is suitable for use as a self color, or in combination with other dyestuffs for the production of tans, browns, etc.

Recipe 149 shows a Navy Blue on cotton yarn produced from Brilliant Direct Navy Blue R obtained from C. Bischoff & Co., New York. The main merits of this dye are its brightness of shade and its good money value. In order to judge of its merits, we call the attention of dyers to the sample as it appears in our Dyers' Supplement.

A. Klipstein & Co., New York, show in recipes 151 and 156 two of their dyes—Acid Violet 4 R for a reddish violet on worsted yarn, and Chlorantine Red for red on cotton yarn. Acid Violet 4 R is fast to light, which will be appreciated by manufacturers. The Chlorantine Red gives a brighter and bluer shade of red than Benzo Purpurine and is not effected by acids, which makes it very valuable as a dyestuff for cotton and wool mixtures.

Recipe 154 shows a cardinal red on worsted yarn obtained from Wool Red B, procured from Wm. J. Matheson & Co., New York. This color produces effects of absolute fastness to milling and fulling, and its fastness to light, washing, acids and similar reagents is superior.

Black on cotton yarn is given in recipe 155, produced from Oregon Black, sold by the Anchor Color Mfg. Co., New York. This is a fast color on either cotton or wool and cotton mixed goods or on cotton hosiery. It is also an excellent black for covering up white cotton specks.

John J. Keller & Co., New York, show in recipe 159 their Diphenyl Blue B M for the production of a blue on cotton yarn. This dye is fairly fast to light and washing. Its merits will be largely seen in the sample as shown in our Dyers' Supplement.

Separating Wool Fat.

There has recently been invented by a German, a process of separating wool fat into its products, or the producing of chemical combinations from raw wool fat. The method pursued produces by steps from raw or distilled wool-fat sebacic acids, soaps, combinations with a high melting-point fit for the manufacture of candles, and other substances of the wool-fat, which cannot be saponified and which consist of a mixture of fat-alcohols with other unknown chemical combinations, and, finally, the transformation of these unsaponifiable substances into their combinations with water.

It is known that raw wool-fat consists, essentially, of ether-like combinations of higher and lower sebacic acids with cholesterine, isocholesterine, and other fat-alcohols. It contains, besides free sebacic acids, mostly fat-alcohols and cholesterine. Distilled wool-fat comprises saponifiable wool-fat, and consists of a mixture of free sebacic acids and fat-alcohols; but besides it contains neutral substances which cannot be saponified and are products of decomposition of the wool-fat produced by the distillation.

The present process is divided into four steps, the succession of which can be changed in any manner, by which is produced, first, a separation of the wool-fat into one part containing nearly exclusively sebacic acids and into another part consisting of a mixture of sebacic acids and fat-alcohols; second, from this mixture of sebacic acids and fat-alcohols by appropriate treatment combinations can be obtained, melting between 60° to 75° centigrade,

which consists, essentially, of sebacic acids; third, the remaining portion being divided into nearly pure sebacic acids and into fat-alcohols, which latter still contain a few sebacic acids; fourth, finally the purified fat-alcohols are worked into their combinations with water.

Making use of these four steps in this succession, in order to separate wool-fat in its constituents, is what is claimed as new.

To execute this process, there can be used raw wool-fat or saponified or distilled wool-fat.

A. If there is used raw wool-fat, one proceeds in the following manner:

I. In order to separate the raw wool-fat into nearly pure sebacic acids on the one side and into a mixture of sebacic acids and fat-alcohols on the other side, it is treated conveniently at water-bath temperature with a double quantity of alcoholic ammonia, whereby twenty to thirty per cent. of the fat is easily dissolved, the free sebacic acids being converted into ammonia salts and a part of the wool-fat being divided into sebacic-acid amides and free fat-alcohols. The used alcoholic ammonia is produced by mixing alcohol of about eighty to ninety per cent, with concentrated watery ammonia or by saturating alcohol of eighty to ninety per cent. with ammonia-gas at ordinary temperature. After depositing, the still warm alcoholic solution is decanted from the deposit, and the decomposition of the latter can only be obtained by repeating several times the described operation or by introducing ammonia-gas into a boiling mixture of alcohol and deposit until complete solution is obtained; but the complete solution and decomposition of the deposit are obtained in a simple manner by heating it with alcohol ammonia under pressure. For this purpose the deposit is placed in a closed apparatus, which may be fitted with an agitator, and with gradual increase of temperature it is heated with the requisite quantity of alcoholic ammonia until all the wool-fat is dissolved, and it is left under pressure until it is found by treating a sample drawn from the reaction product that after it has cooled it will become fluid and dissolve again on warming under ordinary atmospheric pressure. Then all the obtained alcoholic solutions are mixed and heated again until a clear solution is obtained and a few not saponified wool-fat quantities are parted with. The solution decanted from the small quantity of not saponified wool-fat on cooling deposits in crystalline combinations a mixture of fat-alcohols and ammonia-fat acid combinations, while nearly pure ammonia-sebacic-acid combinations remain dissolved. The solid combinations are separated in a convenient manner from the alcoholic solution. The latter is freed by distillation from alcohol and ammonia and the deposit, after mixing it with an equal quantity, by weight, of sulfuric acid or muriatic acid of twenty to forty per cent. strength, is heated by introducing steam for two to three hours. When leaving the mixture to stand without heating it, the sebacic acids separate on the surface of the sulfuric or muriatic acid as a yellow oil, which is then further worked in the known manner. The solid combinations are heated in a distilling apparatus at 100° centigrade until they are freed from alcohol and ammonia, and then the deposit is heated with sulfuric acid or muriatic acid of twenty to forty per cent. strength, as above described, whereby the mixture of the fat alcohols and sebacic acids is separated as a yellow oil.

II. To obtain the combinations with a high melting-point, this oil is dissolved by heating in acetone. Then by cooling the acetone solution there are deposited solid crystalline combinations, which are filtered and washed with acetone until they look nearly pure white. The same after being freed from acetone and dried at 100° centigrade give an oil which on cooling congeals to a crystalline mass with a melting-point lying between 60° and 75° centigrade.

III. If then, to the filtered acetone solution there is added the quantity

necessary of a concentrated alkali solution to convert the still-existing sebacic acids into soaps, which is found by chemical analysis, the greatest part of the sebacic acids is separated as soaps, which can easily be filtered and washed with acetone. Also the production of the high-melting combinations can be left and, as hereinbefore described, the sebacic acids can be separated as soaps. The filtered soaps can be used as such or be worked in known manner as sebacic acids.

IV. The solution separated from the soaps is freed by distillation from acetone, the deposit is dissolved and boiled several hours with a concentrated alcoholic alkali solution, and at last the alcohol is freed by distillation also. The deposit being obtained, which contains besides fat-alcohols small quantities of sebacic-acid soaps, is treated further in the following manner: It is boiled two hours with twice its weight of diluted alcohol of five to ten per cent. strength and is then kneaded while cooling with the same solvent, whereby the soaps are dissolved and the fat-alcohols are transformed into a soft or viscid mass, being a combination of the fat-alcohols with water. Then after finishing the kneading process and decanting the resulting diluted alcoholic-soap solution, this mass is also kneaded at ordinary temperature, at first with a further quantity of the same diluted alcohol of five to ten per cent. and at last with three to four parts, by weight, of water, whereby the water-containing fat-alcohols are produced as a nearly white mass of soft consistence; or the deposit after washing with diluted sulfuric or muriatic acid of about thirty per cent. strength and with water is submitted to distillation in or without a vacuum or with superheated steam, whereby the sebacic acids distil over first and then about eighty per cent. of the fat-alcohols as a thick oil, which for removal of any existing fat-acids and for producing water-containing combinations is boiled and kneaded, as before said, first with twice its weight of a diluted alcohol of five to ten per cent. strength containing two portions of alkali solution of 40° Baume to every hundred portions of diluted alcohol and again with the same quantity of diluted alcohol of five to ten per cent., and lastly with three to four parts, by weight, of water; or the deposit can be dissolved in ether, benzene, or other solvents, the soaps can be removed by washing the obtained solution with water, and then after the solvent has been distilled off the resulting residuum—the fat-alcohols—can be transformed into the corresponding softer combinations by kneading the residuum while cooling with three to four parts of its weight of hot water and repeating the kneading operation two or three times with the resulting mass with the same quantity of water at ordinary temperature until a soft, nearly white mass is produced.

Saponified wool fat and distilled wool fat are operated upon in a slightly different manner, the details of which we will not go into at this time.

Bursting of the Silk Chrysalis

After a careful selection has been made, the cocoons are placed in thin, thoroughly ventilated, wooden or pasteboard boxes, divided into sections, one cocoon in each section. These boxes are then placed, one upon the other, in piles around the room, where the temperature is kept from 72° to 77° F. The higher the temperature the quicker the development, but there is danger of the transformation of the chrysalis into the moth if too high a temperature is reached.

As the hatching of the eggs of the silkworm occurs in the greatest numbers soon after the dawn of day, so does the coming forth of the moth, and now whoever has charge of this must rise early and watch carefully, for as soon as the moths have appeared and spread their wings they are taken out of the hatching boxes, one by one, and prepared for mating.

POWER DEPARTMENT

ELECTRICITY—STEAM—WATER.

The Influence of Mechanical Draft Upon the Ultimate Efficiency of Steam Boilers.

Abstract of a lecture delivered before the Engineering Society, by Walter B. Snow, of the Engineering Staff of the B. F. Sturtevant Co., Boston, Mass.

(Continued from September.)

The ultimate efficiency of a steam boiler is dependent upon three principal factors.

First. The primary cost of the entire plant and the fixed charges thereon.

Second. The quantitative efficiency of the plant as a means of burning the fuel supplied, and transferring its heat to the water evaporated.

Third. The operating expense, including the fuel.

In addition, there are always distinct advantages or disadvantages which, while of marked importance, can only be measured qualitatively in their relation to the superiority of any given arrangement or appliance.

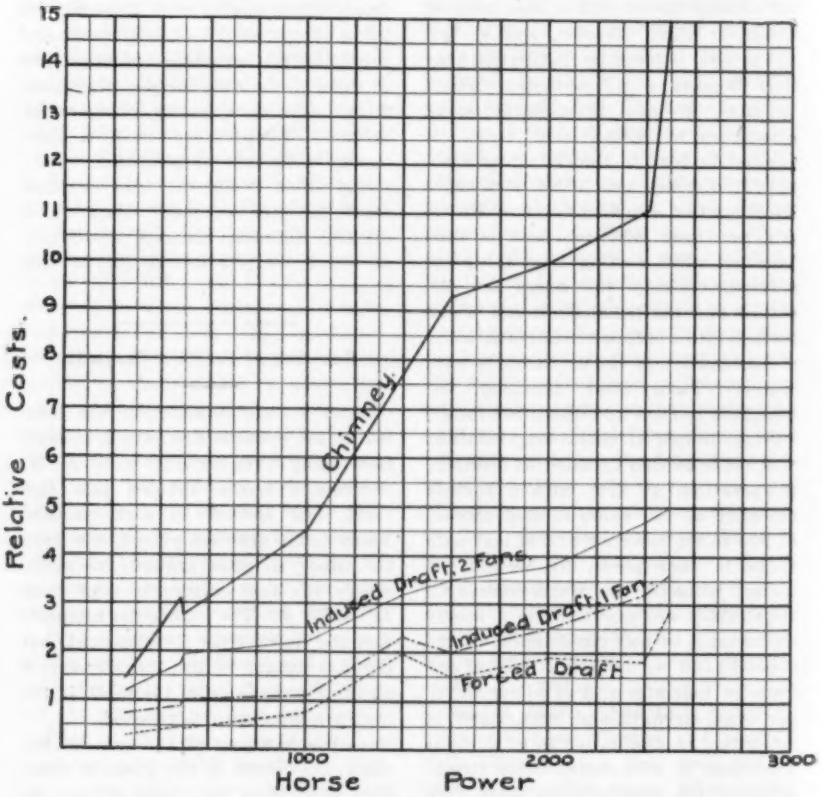


FIG. 3.

So far as mechanical draft has a direct influence upon any of these factors, it is the purpose to here consider its ultimate effect upon the efficiency of the steam boiler plant to which it may be applied. Naturally, the question of primary cost first enters into

the consideration, and secondly, that of maintenance and operation, while both of these items are to be viewed in the light of the efficiency secured. In the matter of first cost, comparison is fundamentally made between the cost of a chimney and that of a mechanical-draft plant which may be introduced as a substitute.

In the accompanying curves (Fig. 3) are presented the relative costs of chimneys and of equivalent mechanical-draft equipments in a number of boiler plants widely different in character and rated capacity. In certain of these, the cost of the existing

FIG. 4.

chimney is known, and that of the complete mechanical-draft plant is estimated, while in others, the cost of mechanical-draft installation is determined from the contract price, and the expense of a chimney to produce equivalent results is calculated. Costs are shown for both single, forced and induced engine-driven fans and for duplex engine-driven plants, in which either fan may serve as a relay. An apparatus of this latter type is evidently most complete, and is necessarily the most expensive. It finds its greatest use where economizers are employed.

An average of the costs for these nine representative plants shows the total expense for installing a forced-draft plant to be only 18.7 per cent., that of a single induced fan and accessories 26.7 per cent., and that of a complete duplex induced-draft plant 42 per cent. of that of a chimney. In each case a short steel-plate stack is included.

In other words, if a chimney be estimated to cost $10,000, there could be saved, on a basis of these averages, the respective amounts of $8,130, $7,330 or $5,800 in the first cost, according to which system of mechanical draft is substituted.

For a good steam boiler plant it is fair to assume the following as average fixed charges:

Interest	5	per cent.
Depreciation and repairs	4½	"
Insurance and taxes	1½	"
Total	11	per cent.

Experience has shown that these figures also hold good for a well designed mechanical-draft apparatus, and are, therefore, so accepted here.

On the other hand, the fixed charges on a chimney may be fairly assumed as:

Interest	5	per cent.
Depreciation and repairs	1½	"
Insurance and taxes	1½	"
Total	8	per cent.

In summarized form, the comparative costs and fixed charges on a ten thousand dollar chimney, and on the equivalent mechanical-draft plants of various types will be as indicated in the table.

COMPARISON OF COSTS AND FIXED CHARGES.

Method of Draft Production.	First Cost.		Annual Fixed Charges.	
	Am't.	Ratio.	Am't.	Ratio.
Chimney	$10,000	1.00	$800	1.00
Induced draft plant (2 fans)	4,200	.42	462	.58
Induced draft plant (1 fan)	2,670	.267	294	.37
Forced draft plant (1 fan)	1,870	.187	206	.26

The fact that the mechanical draft apparatus can usually be placed overhead or on top of the boilers, where it occupies no valuable space, and that

the space otherwise occupied by the chimney is at the same time rendered available, makes possible a further saving, which is necessarily dependent upon land values. Within city limits, it may readily amount to $1,000 in a plant of a thousand horsepower.

The relative proportions of a brick chimney, and of the smoke pipe required when mechanical draft is introduced, are forcibly shown in the accompanying illustrations, Figs. 4 and 5.

The present stack or smoke pipe, barely visible in Fig. 5, extends only

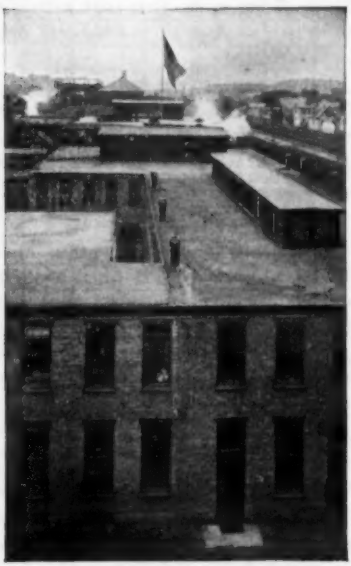


FIG. 5.

31 ft. above the ground, and no trouble whatever is experienced from smoke, in fact no smoke is produced.

A concrete case illustrating the possibilities of mechanical draft is presented in the accompanying drawings, Figs. 6 and 7. These show a plant of 2400 h. p. of modern water-tube boilers, 12 in number, set in pairs and equipped with economizers. Fig. 6 indicates the location of a chimney, 9 feet in internal diameter by 180 feet high, designed to furnish the necessary draft. Fig. 7 represents the same plant with a complete duplex induced-draft apparatus substituted for the chimney, and placed above the economizer connections. Each of the two fans is driven by a special engine, direct-connected to the fan shaft, and each is capable of producing draft for the entire plant. A short steel-plate stack unites the two fan outlets and discharges the gases just above the boiler house roof. All of the room necessary for the chimney is saved, and no valuable space is required for the fans.

In round numbers the cost of the plant is, in detail, as here shown:

COST OF BOILER PLANT WITH CHIMNEY.

12 boilers	$37,000
2 economizers	10,500
Boiler and economizer settings and by-passes	9,000
Automatic damper regulators and dampers	400
Chimney, including foundations	10,700
Boiler house	11,500
Total	$79,100

RELATIVE COSTS.

Chimney Draft.

Cost of chimney	$10,700
Cost of damper regulators and dampers,	400
	$11,100

Mechanical Draft.

Cost of mechanical draft plant, complete	$4,700
Saving by using mechanical draft	6,400
	$11,100

The costs of the chimney and the mechanical-draft apparatus, which are also indicated, show a saving in first cost of $6,400, as the result of using the mechanical-draft method.

The intensity of draft produced by a fan, and the readiness and economy with which it may be secured, make it a simple matter to maintain a combustion rate higher than that ordinarily obtained with a chimney.

The comparatively low rates of combustion, which have heretofore obtained, are largely due to the inability of the ordinary chimney to overcome the increased resistances incident to the maintenance of a higher rate. Boilers have been proportioned to meet these conditions, but it is manifest that, by changes in design or by the introduction of heat-abstractors, they may, under the influence of me-

chanical draft, be readily operated at considerably above their original ratings, with substantially the same efficiency. As a result, it is possible to obtain a given output with a plant of less size and first cost than is possible with a chimney. This is particularly true where the steam consumption is liable to sudden fluctuations for comparatively short periods.

(To be continued.)

The Circumference of a Circle.

All of the hand-books that tell us anything about a circle, tell us the circumference of a circle is found by multiplying the diameter by the decimal number 3.141592. Now we know that the circumference of a square is found by multiplying the side of the square by 4; and it is easy enough to understand that the circumference of a circle may be found by multiplying the diameter by something. The only point of difficulty about the case is, to see how we know that the particular long number that is given above is the thing to multiply by; and out of the multitude of engineers' books that have come to our notice, we do not recollect ever finding one in which any attempt is made to clear up this point, and explain how we know that the number 3.141592 is the right one to use.

If we are going to understand this matter at all, we must make up our minds not to object to a little mathematical reasoning; for the problem in hand, being purely mathematical in its nature, must be solved by purely mathematical methods. We shall not go into it at all deeply, however, but shall content ourselves with showing how the circumference of the circle can be investigated by anyone who is good at figures, and has plenty of time and patience and paper and pencils.

As a starting point for our calculations, let us suppose that we have two circles of exactly the same size. Around the first one let us draw a regular figure with any number of sides we please, the sides being all equal to one another, and all just touching the

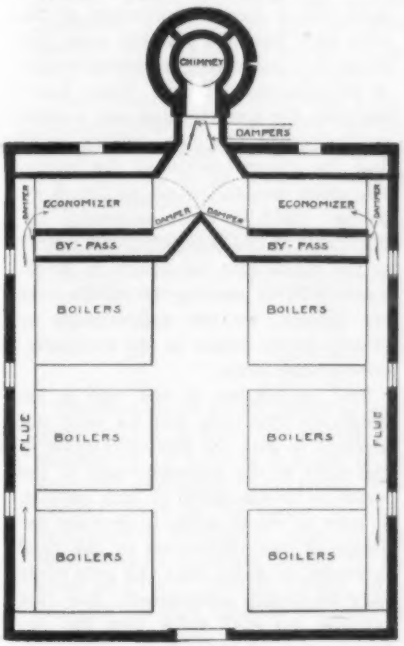


FIG. 6.

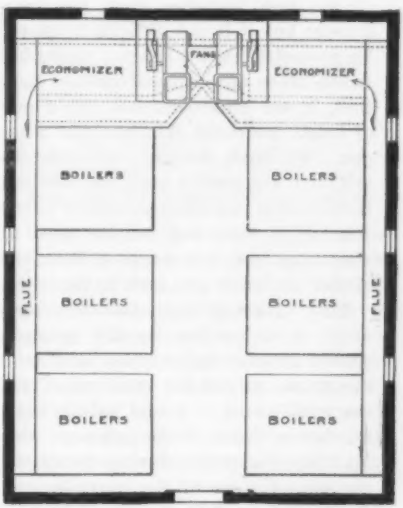


FIG. 7.

MECHANICAL DRAFT.

circle, but not cutting it. A figure of this sort with five sides is shown, for the sake of illustration, in Fig. 1; but it should be understood that what we are about to say is in no wise restricted to this particular number of sides, but it is equally true, whatever the number of sides. Having drawn a figure of this sort, with some definite number of sides, around the first circle, let us now draw around the second circle a figure precisely similar in its nature, but with just twice as many sides as the first one. (If the first one had five sides, as in Fig. 1, the second one will have ten sides, as in Fig. 2.)

The figures that we have drawn around the circles are called "regular polygons." We may not know how to calculate the circumference of either of the two polygons that we have drawn; but it is not difficult to prove, by geometry, that a relation exists between these two circumferences, such that, if we could find out either one of them, we could calculate the other one. We shall not give the proof itself, but will merely state the relation between the two circumferences in the form of a rule, and for the sake of simplicity we will suppose that the circles are each one inch in diameter.

Rule. Having given the circumference of a certain regular polygon drawn around the polygon, and take the square root of the sum. (2d) From the square root so found subtract the number of sides of the polygon. (3d) Multiply the remainder by twice the number of sides of the polygon, and divide the product by the polygon's circumference. The quotient so found will be the circumference of the polygon having twice as many sides as the first one, and drawn, like the first one, around a one-inch circle.

Without, as yet, going into any actual calculations, we can see how this rule will enable us to calculate the relation that the circumference of a circle bears to its diameter. For example let us draw a large number of circles, each one inch in diameter, as suggested in Fig. 3. Around the first of these let us draw a square (or, in other words, a "four-sided regular polygon"). Around the second let us draw a regular polygon of eight sides, around the third a regular polygon of sixteen sides, and so on, as far as we please, doubling the number of sides each time. It is easy to see, without any calculation at all, that the circumference of the first polygon of this series (i. e. the square) is 4 inches. Knowing this fact, the rule just given enables us to calculate the circumference of the second polygon—that is, the eight-sided one. Then, when we know the circumference of the eight-sided one, a second application of the rule, with this as a starting point, enables us to calculate the circumference of the sixteen-sided one. Then, starting with the sixteen-sided one, a third application of the rule enables us to find the circumference of the thirty-two sided one, and so on, as far as we please. Each of these successive applications of the rule brings us nearer to the circle that we desire to investigate; and by pushing the calculations far enough, we can approximate as closely as we please to the circumference of the circle.

The application of the rule is exceedingly laborious, and we shall not attempt to give the full calculation of the ratio of the circumference of the circle to its diameter, by this method. It may be worth while to give one example of the application of the rule, however, in order that the rule itself may be clearly understood. For this purpose we shall show how the circumference of the octagon (or eight-sided polygon) is computed from that of the square. The circumference of the square is 4, and the number of its sides is 4. Following the rule, we multiply the circumference by itself, and we have $4 \times 4 = 16$. Then the square of the number of sides happens to be 16 also; and adding these two together, as the rule requires, we have $16 + 16 = 32$. Next, we extract the square root of 32, and after considerable figuring we shall find that this square root, to eight places of deci-

mals, is 5.65685425. The rule now requires us to subtract from this the number of sides of the polygon. This gives us

$$5.65685425 - 4 = 1.65685425.$$

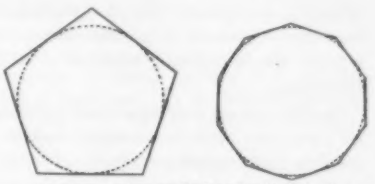
We are next to multiply this by twice the number of sides of the square, and then to divide by the circumference of the square. If we do this, we shall find, as the final result, that the circumference of the octagon is 3.31370850″. A second application of the rule will then give us the circumference of the polygon with sixteen sides, and so on. To show how the process works, and how the figures gradually draw up to the accepted decimal that we quoted at the beginning of this article, we will give the circumferences of the first twelve regular polygons of the series, to six places of decimals (each polygon being supposed to be drawn around a one-inch circle).

Circumferences of Regular Polygons, Circumscribed about a Circle of Diameter = 1.

Number of Sides of Polygon.	Circumference of Polygon.
4	4.000 000
16	3.182 598
64	3.144 118
256	3.141 751
1,024	3.141 602
4,096	3.141 593

The final result to six places of decimals, it will be seen, is, that the circumference of a circle is equal to its diameter multiplied by 3.141593. The number given in the books, for this ratio, almost invariably ends, in the sixth place of decimals, with a "2" instead of a "3." This is wrong, however, for the true value of the number in question to ten places of decimals, is 3.1415926536; and if we throw away the last four decimals and keep only six of them, we ought to increase the sixth decimal by one unit, and call it a "3," since what we are throwing away is more than half of a unit in the sixth place.

A great many methods of calculating the circumference of a circle are known, and some of them are far easier of application than the one we have given here, although they require a considerable knowledge of mathematics for their clear comprehension. The circumference of a circle can be calculated in terms of the radius to within any proposed limit of accuracy; but it can never be expressed with absolute precision, because the ratio of the circumference to the diameter consists in a decimal that never ends, and never repeats itself. A great many enthusiasts have worked over this decimal, and it has been calculated (if we remember correctly) to seven hundred places, presumably in the hope that somewhere or other it might begin to repeat itself, and hence be capable of expression in finite form. The general problem of expressing the ratio of the



Figs. 1 and 2. — Five and Ten-Sided Regular Polygons.

Fig. 3. — Showing the Approach of the Polygons to the Circle.

circumference of a circle to its diameter with absolute precision, and yet without the use of a never-ending decimal, is commonly known as the problem of "squaring the circle." It has been recognized, for a long time, that it is probably impossible to "square the circle," and yet no absolute proof of this impossibility was given until 1882, when such a proof was first published by the German mathematician Lindemann.—The Locomotive.

Cotton Compress Decision.

The recent decision of the Patent Office, giving to the Planters' Compress Company, Boston, an exclusive right to a spiral bale of cotton, wool, hay, etc., was made in the progress of the infringement suit lodged by the American Cotton Company. In the original case the decision was in favor of the Planters' Compress Company, but the American Cotton Company appealed the case to the Commissioner

of Patents, who sent it back to the examiner. On a rehearing the examiner has reaffirmed his original decision, thus securing the patent to the Planter' Compress Company. The basis of the American Cotton Company's claim rested on the Pilter press, with which the Lowry press is thus declared to have no resemblance. This decision gives the Planters' Compress Company a clear field for spiral or helical bales.

A Wall Coating for Mills.

It is a well known fact that white reflects a large percentage of light. White is also productive of cleanliness. For these reasons it is customary to whiten the walls and ceilings of mill buildings.

In 1892 a wall coating called "muresco" was put upon the market and the owners and superintendents of some of the largest textile mills in the country have found it much less expensive than paint and far superior to whitewash or any other material intended for the purpose.

"Muresco" is sold in a dry, powdered form, in barrels, and with the addition of boiling water it is ready for use. No particular experience or skill is required to apply it; any man employed about a mill can do a good job with it.

It is economical because of its low cost and superior covering, spreading and working qualities. It will cover a greater surface, it is claimed, and cover it better than any other material. It works so smoothly and freely under the brush that a great saving in time and labor is effected by its use.

"Muresco" may be applied to all surfaces as plaster, brick, stone, wood or metal. It does equally good work on new or old buildings. It will cover smoked, stained or burned surfaces, and one coat will produce a perfectly white finish that will not turn yellow with age.

The adhesive properties and extreme durability of this material are valuable features, and when properly applied it forms a hard and smooth surface that will not flake, peel or rub off, even where there is considerable vibration caused by heavy machinery. Textile manufacturers will appreciate this point, as valuable machinery and fabrics are often damaged by the flaking or peeling of whitewash and other inferior wall coatings.

It possesses great merit, it is said, as a fire retardent. This fact is recognized by insurance men, who have, in some cases, made a reduction in rates on buildings in which the wood-work is coated with it.

"Muresco" is free from all poisonous matter and will not injure the health of operatives, and the smooth, silky effect which it produces is peculiarly pleasing and restful to the eyes. Another point about it is that after it has once been used, subsequent coats may be applied at any time, without scraping or washing off the old material and with no danger of the previous surface rubbing up or peeling. It can be readily washed off if required, however.

While the merits of "muresco" for mill buildings have been dwelt upon here, its usefulness is by no means confined to that field. It is recognized by prominent painters and decorators throughout the country as a practical material for decorative purposes, and it has been used on some of the largest and finest private and public buildings.

Besides XX white, "muresco" is made in fourteen tints. It is manufactured by Benjamin Moore & Co. with offices and factories at Brooklyn, New York, and at Chicago, Ill., and mills at Hancock, Pa. This company owns the patents and trade-mark for "muresco."

—The household woolen industry in the English colonies of America was a source of constantly increasing irritation and annoyance to the manufacturers and the statesmen of the mother country.

—It is often considered desirable that mercerized cotton should rustle like silk as well as have the silky lustre. This result is much facilitated by bleaching the mercerized material.

QUESTIONS AND ANSWERS

Under this head we undertake to answer, free of charge, to the best of our ability, any pertinent inquiry pertaining to textile matters received from any regular subscriber to the TEXTILE WORLD. Questions should be stated as briefly and concisely as possible. Inquiries pertaining to textile processes, machinery, improvements, methods of management, the markets, etc., are especially invited, as well as any legitimate discussion on the views expressed. All inquiries must be accompanied by the name of the person inquiring, not for publication, but as an evidence of good faith.

Powlas System.

Editor Textile World:

Can you inform us who makes the improved self-acting knot health knitting machine, Powlas system?

C. G.

Can any of our readers furnish the necessary information?

Product of Twine Mill Wanted.

Editor Textile World:

Our business of late has grown to such an extent that we shall have to take on part of the output of some other mill besides the —— Cotton Mills of this city, making cotton twine and cordage. We should be glad to hear from any mills interested and also would like to know of mills having an undisposed output of jute and flax twine and cordage, also some twine and trout line.

A. R. K.
Manufacturers' Agents.

Gelatine for Hectographs.

Editor Textile World:

Can you furnish me with a formula for making a gelatine used for the production of hectographs?

S. B.

We believe that the following is a good formula: 90 parts glue; 160 parts water; 280 parts glycerine, evaporated without boiling to 400.

Thin Rubber Goods.

Editor Textile World:

With this you will find a sample of rubber tissue, very thin, as you will observe. I should like to know where this can be obtained.

J. K.

Write to the Franklin Rubber Company, 12 Franklin St., Boston.

Mangle Cloth.

Editor Textile World:

We desire to purchase mangle cloth like the enclosed sample. Can you tell us where we can obtain it?

L. A. W.

Write to Williams & Paige, 75 Chauncy Street, Boston.

Wool Pulling Establishments.

Editor Textile World:

I should be pleased if you would send me the address of parties that pull wool from the skin and finish the hide for leather, in the States and in Canada.

F. P.

We would suggest that our correspondent get a Textile World Directory and pick out for himself the names of parties that pull wool and dress the skins of sheep. In the meantime, we might suggest the following parties that do this sort of business: C. G. Mackintosh and J. P. Thomas, both of Peabody, Mass.

Trust Laws.

Editor Textile World:

Is there an anti-trust law for the State of New York? I understand that one was passed last year. I should like to know if such was the case.

J. A. S.

There was such a law, known as the Donnelly Anti-Trust Law, passed by the late legislature of New York State. This law has recently been brought into prominence by the hearing before the attorney general of that State for the commencement of proceedings against a New York corporation, on the ground that it attempted to fix retail prices through its contracts with dealers. If our correspondent wishes to familiarize himself more with this law, we will refer him to the New York laws of 1899, chapter 690. The title of this chapter is "Monopolies."

Smell in Bleached Mixed Goods.

Editor Textile World:

Can you tell me how I may get rid of the annoying smell in mixed goods bleached in the smoke house? I have tried all kinds of chemicals, have washed in many waters and have even given a final scouring, but the characteristic odor remains.

Bleacher.

It is very hard to get rid of the sulphurous and sulphuric acid odor, and any treatment for that purpose by strong chemicals will most always injuriously affect the goods. We should advise our

correspondent to look up what has been written about Peroxide bleaching which by its nature cannot leave a smell and which at the same time is said by such authorities as Sansone, Hummell and Gardner to be the best bleach to use on goods composed of mixed animal and vegetable fibres, as the treatment is equally harmless to either. The peroxides which come in question are Sodium Peroxide and Hydrogen Peroxide, of which the former is the more economical in application and a stock of the same may be kept for any length of time; the latter is simpler to use but more expensive and unreliable in strength.

Wages on Hosiery Yarns.

Editor Textile World:

We would be much obliged if you could give us, or procure for us, the wages that are paid to mule spinners in the Eastern States, on hosiery yarns that number from 8s to 18s.

H. C.

The best answer to this inquiry that we are able to give is the amount of wages paid to mule spinners on hosiery yarns in Fall River, which is $12.28 per week. The men are paid a weekly wage, rather than by piece work, which is customary on other kinds of yarn. If these spinners were on piece work they might probably earn more, but better results are thought to be obtained by paying the men day pay, as the product is generally better on account of this system, the machinery not being pushed to the extent that would be the case if the work were done by the piece.

Drafting Shirts, Etc.

Editor Textile World:

Please inform us where we can get a book of instructions on drafting shirts, overalls and duck coats.

C. S. O.

We would suggest our correspondent's writing to the Tailors' Review Co., 78 Fifth Ave., New York City. They have such a book, we understand, that was issued some three or four years ago. From what we know of it, it is as good as can be secured; in fact, we believe it is the only one published on shirt cutting. The John J. Mitchell Co., 103 Fifth Ave., New York, might be able to furnish some information on this point.

Planters' Compress Co.

Editor Textile World:

Can you tell me anything regarding the capitalization, etc., of the Planters' Compress Co., and of the Indo-Egyptian Compress Co., the two, as I understand it, having close relationship one to the other. I hear good reports about these companies and desire to know more about them.

A. D.

The capitalization of the Planters' Compress Co., is $5,000,000 and that of the Indo-Egyptian, $15,000,000. We understand that the former is to be increased to $15,000,000. The majority of the stock is said to be deposited with a voting trust for five years. This company manufactures what is known as the Lowry round bale press, which is meeting, so far as reports that come to us are concerned, with success. Subsidiary companies operate the presses and the parent company receives as royalty 38 per cent. of the gross receipts. We do not know how many presses are used, but we have the impression that there are about 50, but additions are being made constantly. It is expected that over 500 of these machines will be in operation this season. The Indo-Egyptian Co. owns the foreign patents of this machine.

Glazed Black Cotton.

Editor Textile World:

Can you kindly give us the names of concerns as are selling glazed black cotton?

N. J.

We would suggest that our correspondent write to those advertising in the yarn department of this magazine. He will find among them some that can furnish him with the kind of yarn that he desires.

Denim Wanted.

Editor Textile World:

Can you inform us where we can purchase an 8-oz. slate denim, good shade and pump weight at about 8¾ cents?

H. M.

We would refer our correspondent to the Textile World's Directory, which will furnish him with the names of parties that make and sell this class of goods.

Change Gears in the Carding Room.

Editor Textile World:

Will you send me information all through the card room, how to make any kind of change for spinning all kinds of yarn? I should like to know the name of every gear in the carding department.

E. H.

I think our correspondent hardly realizes the amount of labor that he has asked us to perform. Aside from that, we could not answer his query satisfactorily without knowing the machines that he is using, and there is no one machine suitable for spinning all kinds

of yarn. This question covers too much ground to be answered without a thorough knowledge of the gearing and the make of the machines in use. It would be better if our correspondent would name to us the numbers of yarn that he wishes to make and send a list of gearing that he has on hand and the name of the makers of the machines that he has. We would suggest, however, that he write to the makers of the machines that he has under his care for this information.

Manual on Knitting.

Editor Textile World:

Where can I obtain a practical manual on knitting of all kinds?

M. E. S.

There are practically no books on knitting and the best source of information is from the technical journals that are regularly issued. There is a book possessing some merit that may be of benefit to our correspondent, entitled "Trimming and Finishing of Hosiery and Hosiery Fabrics," by J. H. Quilter, published in 1889, price $1.25. This undoubtedly can be obtained of D. Van Nostrand Co., Murray St., New York City.

Books on Knitting.

Editor Textile World:

Do you have any textile books on knitting which fully explain the use of cotton and wool and the different kinds of goods that can be made on circular knitting machines?

J. D. R.

There is nothing published in the form of a book that will answer the above inquiry. The best thing for our correspondent to do is to subscribe for technical journals that take up the subject of knitting. Builders of knitting machines oftentimes have catalogues that furnish valuable information on such points.

Woolen Crochet Lace.

Editor Textile World:

Where can I buy woolen crochet lace for trimming ladies' cardigan jackets, for around the front, neck, bottom and sleeve holes?

G. E. O.

Can any of our readers furnish the necessary information?

Cotton Duck.

Editor Textile World:

There is manufactured somewhere in this country a heavy cotton duck, which I believe is dipped in a rubber solution, making it waterproof. These goods I believe come in widths of 24 inches to 36 inches. Can you give me the names of those manufacturing or handling this class of goods? I desire using it for men's cheap mittens.

C. H. H.

We have given, by mail, the addresses of several parties that we think can supply the wants of our correspondent.

Bi-Sulphide of Carbon.

Editor Textile World:

Can you give me any formula for using bi-sulphide of carbon as an agent for bleaching or for removing oil and dirt from waste?

J. O. G.

We never heard of this material being used for bleaching. As this is a powerful solvent of fats and oils, it can be used in extracting these substances from wool, etc. It is also inflammable, burning with a bluish flame with evolution of sulphur dioxide and carbonic acid gases. For purposes of extracting oils, greases, etc., the methods of operation are similar to those when gasoline and naphtha are used.

Wants to Learn the Dyer's Trade.

Editor Textile World:

I take the liberty to inquire if it is in your power to help me out of trouble. I have a son eighteen years of age, who is eager to learn the dyer's trade. He has attended a chemical school in Germany. I do not know where to apply, and, therefore, ask your advice.

S. C. H.

We would suggest that our correspondent consider the sending of his son to a textile school, such as are organized in the cities of Philadelphia, Lowell and New Bedford, and have him take a course in chemistry and practical dyeing. He can obtain the necessary information in regard to instruction of this kind by addressing the principals of these schools.

Angora Goats.

Editor Textile World:

I notice in the United States Report of Agriculture that your publication is referred to for data concerning the raising of angora goats. I am looking for such information and should be pleased with anything of this kind that you can furnish me.

C. C.

We answered some inquiries of this nature in our August issue, and would refer our correspondent to the same. We had a long article in that issue on the angora goat husbandry, to meet just such an inquiry as this.

New Publications.

Catalogue Making. The past decade has witnessed a great advance in the art of catalogue making, particularly in the machinery trades. The modern catalogue must not only be attractive, and this seems to have been the sole idea in some recent publications,—but it must above all serve in the best manner possible its primary purpose of furnishing information. Illustrations must be clear, explanations explicit, and all information concisely given. The substantial character of most machinery demands similar character in the make-up of the catalogue describing it. Bold, clear type, black ink, good cuts, simplicity in composition and first-class paper of good weight, all have a subtle influence in impressing the reader with the idea of the high quality of the articles described. An excellent example of good catalogue making, in which this is the controlling idea, is presented by the B. F. Sturtevant Co. Their publications are of two classes. First those which are purely educational in their character, comprising treatises on various special applications of fan blowers, reprints of lectures on similar subjects, leaflets regarding the attendant advantages etc. Second, the regular trade catalogues of the standard dimensions, 6½ inches by 9 inches, each devoted to a specific line of manufactured goods. Separate catalogues in the same class bear the same cover design, but are printed and bound in different colors with proper titles, so that they may be readily distinguished. All catalogues are designated by individual numbers, the latest being No. 110. The most recent products are immediately presented by Bulletins (designated by letters) preliminary to the issuance of complete catalogues regarding the given machines. Loss of time is thereby avoided and the new designs can be sooner placed before the public.

Embroidery Lessons with Colored Studies. New London, Ct.; The Brainerd & Armstrong Co. 138 pages. Price 10 cents. This is the latest book on the subject of silk embroidery and popular fancy work that has been published. It has been edited by a corps of expert embroiderers under the direction and supervision of the publishers. It contains a large number of designs, both colored and plain black and white. The character of the book may be judged from the following, taken from its contents; laundering of embroidery, care of hands and selection of needles, rules of harmony and contrast, hemstitching, popular styles of embroidery, how to embroider flower stems, embroidery hoops, embroidery hints from nature, lessons in embroidering flowers, sofa cushions for embroidery and college colors.

Diamine Beta Black B. This is the title of a color card issued by William J. Matheson & Co., New York, showing the appearance of this dye upon cotton. Dyers would be interested in this card, and we would suggest their writing for it.

Oxy Diamine Red S. Wm. J. Matheson & Co., New York, have issued a color card showing this dye on cotton goods and yarn. The properties of this dye are represented to be fastness to washing, to light, to acid and to ironing. The card will be sent to any dyer or manufacturer on application.

Fibre Goods. This is the title of a catalogue and price-list issued by the Walrus Fibre Mfg. Co., Medford, Mass., giving illustrations and descriptions of roving cans, trucks and factory cars, baskets, barrels, doffing bobbin, and other boxes, etc., etc. The manufactures enumerated in this catalogue are of the standard sizes and construction. The merits of fibre are well known to manufacturers for strength, etc., and it is largely used for gear wheels, bushings and friction straps, besides roving cans, etc. The catalogue will be sent upon application.

Making Records. This is the title of a brochure of 32 pages, issued by the Joseph Dixon Crucible Company, Jersey City, N. J. The object of this is to show how Dixon's flake graphite helps in lubrication. It can be obtained by application to the publishers.

Farbenfabriken of Elberfeld Co., 40 Stone St., New York, have issued, of late, a number of color cards, to which we refer as follows: Benzidine Colors are described in a pamphlet, supplement to a previous one issued in 1896, covering a list of yellows, greens, blues, violets, browns and blacks. Thiazole Yellow R is shown in a leaflet, being a new brand of color belonging to this firm's Thiazole Yellow, which afterwards will be known by the letter G. This dye is a true cotton dyestuff and is adapted for the production of yellow shades on cotton in all branches of manufacture, as well as for half silk and half wool, and for shades on wool fast to milling and steving. Phenylamine Black J and 4 B. Here is a dye described on a leaflet and is recommended especially for piece dyeing. Benzo Nitrol Brown B is a valuable addition to this firm's Benzo Nitrol browns, producing a full and clear brown shade fast to alkalies and acids and extremely fast to washing. Alizarine Blue W R N is a dye producing shades of blue on wool. It is more of a homogeneous product, and is described in a leaflet with colored sample, issued by this firm. Basic Colors on cotton yarn is the title of a color card showing some extremely fine results. Victoria Blue B and New Victoria Blue B dyed on silk are dyes shown on a color card. Both of these products, owing to their brightness of shade, have become very popular. Shades on Ladies' Dress Material, wool and mercerized cotton, is the title of an enlarged pattern card similar to a smaller one issued by this concern a short time ago. This card contains 48 different shades produced by combinations of dyestuffs which are most suited for this class of dyeing. Alizarine Brown K G is a dye described on a leaflet and is used for cotton, meeting the utmost requirements and can be employed either as a self color or in combination. There are several brands of this dye.

Diamine Colors coupled with Diazotised Paranitraniline (Nitrazol). This is the title of a color card issued by Wm. J. Matheson & Co., New York. This dye is used on cotton and the coupling methods are worth the attention of dyers.

Cyanole F F. This is the name of a dye sold by Wm. J. Matheson & Co., New York, and is described and samples shown in Bulletin No. 75, issued by this concern. The properties in this color very closely resemble this firm's Cyanole

Extra, except that the new brand yields shades of blue on wool considerably brighter and purer than the older brand.

Lombard Water Wheel Governor. This is the title of a pamphlet just issued describing and illustrating a water wheel governor made by the Lombard Water Wheel Governor Co., Boston, Mass. The object of this pamphlet is to show the valuable features of the type "F" governor made by this concern, for which, it is claimed, a closer degree of speed regulation can be obtained than with any other form in connection with an impulse water wheel. Those having water wheels should write for this pamphlet.

Wool Manufacture. London: George Bell & Sons. This is the third edition of this work, containing many extensions of the subjects treated, being a practical treatise for the use of all persons employed in the manipulation of woolen and worsted cloth. The author, Roberts Beaumont, is the professor of Textile Industries, Yorkshire College, Leeds, Eng., and is well known as a writer. The book contains over 250 illustrations, and relates to materials; woolen thread manufacture; worsted thread construction; yarns and fancy twisted threads; loom mounting; preparation of the yarns for the loom; principles of cloth construction; hand looms; power looms; weave combinations; draughting; pattern design; color applied to twill and fancy weaves; backed and double cloth; analysis of cloths and calculations; cloth finishing. Price $3.

Farbenfabriken of Elberfeld Company, New York, have issued color cards relating to their Naphtaline Acid Black 4 B, on knitting yarn, cheviot and worsted cloth; Azo Acid Blue 6 B, Victoria Violet 4 5 S and combinations on woolen cloth and wool and silk cloth. These we think will prove of sufficient interest to dyers to warrant them writing for them.

William J. Matheson & Company, New York, have issued color cards relating to their Cyanole Green B; Cyanole F F; and Diamine Blue Brands. Dyers can obtain these on application.

Mayo Knitting Machine & Needle Co.

An interesting exhibit of automatic seamless knitters at the National Export Exposition is that of the Mayo Knitting Machine & Needle Co., of Franklin, N. H., who also have a Philadelphia office in the Knickerbocker building, corner 6th and Arch Sts.

The merits of their well known Acme machine has made it very popular with hosiery manufacturers. They have been obliged to run their extensive plant overtime for the past twelve months, and it is now running continuously day and night with two sets of hands on large orders from representative mills in every section of the country.

The Acme has the latest improvements and attachments for producing all styles and kinds of seamless hosiery. These attachments are mostly interchangeable, thus making a thoroughly universal machine. The new transfer device with removable points must be seen to be appreciated.

The Mayo Knitting Machine & Needle Co., have in connection with their machine works a thoroughly equipped plant for making latch needles for their own and other machines.

B. M. Denney, the veteran knitting machine builder and inventor, has charge of the exhibit and also the Philadelphia office of the company.

The following prominent hosiery mills have recently placed orders with the Mayo Knitting Machine & Needle Co., for their Acme knitters: John Blood & Co., Philadelphia, Pa.; Pilling & Madeley, Philadelphia, Pa.; C. & J. Gould, Philadelphia, Pa.; William Bennett, Philadelphia, Pa.; C. & G. Sasman, Philadelphia, Pa.; H. A. Romberger, Middletown, Pa.; Rambo & Regar, Norristown, Pa.; Fisher & Jones, Lykens, Pa.; Blue Ridge Knitting Co., Hagerstown, Md.; Ipswich Mills, Ipswich, Mass.; Chicago-Rockford Hos. Co., Kenosha, Wis.; Cooper, Wells & Co., St. Joseph, Mich.; Mascot Knitting Mills, Sweetwater, Tenn.; Atlanta Hosiery Mills, Atlanta, Ga.; Raleigh Hosiery Co., Raleigh, N. C.; Jonesville Knitting Mills, Jonesville, S. C.; Llaguno & Tejada, Leon, Mexico; Winsted Hosiery Co., Winsted, Conn.; Alden Knitting Mills, New Orleans, La.

"Cling" vs. "Stick."

These two words are used in the same sense in very many instances When a fly settles down on a piece of Tanglefoot fly paper, it is only a choice of words whether he clings or sticks. He sticks to the paper and the paper clings to him. In speaking of good qualities of belt dressing, however, it makes a good deal of difference whether we employ the word "cling" or "stick." Very many belt dressings do stick, being made of a sticky substance purposely, so as to prevent slipping on the face of the belt, but this very stickiness is an objection, because the belt when so treated is peeled off the pulley with every revolution, meaning loss of power, as well as an unnecessary wear on the belt. One of the strong points of "Cling-Surface" belt dressing, which we spoke of last month in an article headed,—"It Makes a Belt Stick," is that the belt does not stick and that it takes no power whatever to release the belt from the pulley on account of the stick. We think the good points of the dressing were made clear in the article itself, but the man who wrote the heading inadvertently committed an "Irish bull." There is a fine distinction between these two words, and in this distinction lies the principal feature of a good belt dressing; viz., its ability to take hold and cling while on the face of the pulley and to let go the moment it has passed the point of effective pull.

A Roof Party.

The Holbrook Mfg. Co., well known textile soap manufacturers at 466-470

Washington St., New York City, entertained about 200 invited guests on their roof on Sept. 29th, where a fine view of the Naval Parade in honor of Admiral Dewey was to be had.

This up-to-date firm is now sending out to the trade a handsome little booklet describing and illustrating the different yachts that have competed for the cup in the past 48 years. It makes an interesting souvenir.

—One of the latest and best methods of keeping up to date in cotton manufacturing is to subscribe to the lessons of the American Correspondence School of Textiles, New Bedford, Mass. Free catalogue of this institution on application to Dept. C of Textile Correspondence School, New Bedford, Mass.

—The Union Metallic Cartridge Company, at Bridgeport, Conn., have placed an order with The Berlin Iron Bridge Co., of East Berlin, Conn., for an extension of their three story factory building on Barnum Avenue, and connecting same with a bridge across Barnum Avenue to a factory building on the opposite side of the street.

—The Lee-Odlum Boiler Co., Memphis, Tenn., whose advertisement appears in our columns, is exceedingly busy at this time. This is one of the largest and best equipped shops south of the Ohio river for the manufacture of boilers, tanks, penstocks, etc., and they are rapidly extending their lines in textile mill requirements.

—C. H. Hammer, Jr., & Co., 423-425 Belgrade St., Philadelphia, Pa., are ready to buy for spot cash, lots of second-hand card clothing or leather belting. Mills which are closing out their old machinery for any reason, would do well to correspond with the above named firm. See ad.

Clutches.

Epping, N. H., Jan. 30, 1897.

The Eastern Machinery Co., New Haven, Conn.:

Dear Sirs: In regard to your Frisbie Clutch Pulley: would say that I would not feel able to run a plant without one.

We have three of them in use for the last three years, and they are in as good a condition as the first week's service and have been no expense to us for repairs.

For shutting off the power in the event of accident, I would say that through my thrilling experience it has no equal. It saved the life of the writer two years ago.

Yours respectfully,
Granite State Brick Co.,
F. I. Shares, Supt.

—One of the greatest obstacles in the way of positively ventilating small apartments has been the difficulty of operating the fan introduced for the purpose. The B. F. Sturtevant Co., of Boston has made a careful study of this problem, has reduced the apparatus to the simplest form, and presents in its Bulletin M. illustrations and descriptions of its electrically driven propeller fans. The motor is directly attached to the fan shaft. The fan is of the most efficient type, and the entire arrangement is readily portable. It may be instantly started and stopped by the mere operation of a switch.

—The American Moistening Company, of Boston, Mass., will make an extensive exhibit of their system of humidification at the National Export Exposition to be held in Philadelphia, opening from the 14th inst. to Nov. 30th. The system will be shown in operation, and all interested are most cordially invited to inspect the same in the Main Building, Section P. No. 8.

—The American Thread Company have placed an order with the American Moistening Company, Boston, for the entire equipment of their No. 4 Willimantic Mills, Willimantic, Conn.

—The Saratoga Traction Company, of Saratoga, N. Y., have placed their order for a new viaduct with The Berlin Iron Bridge Company, of East Berlin, Conn.

Tussah Silk.

Cornelis, Chailly & Co., under the name of the Tussah Silk Bleaching Co., 339 East 107th St., New York, have just started for the special purpose of bleaching tussah silk. This concern has a process by which these wild silks are bleached to a fine white at a low price, the tenacity and elasticity of the fibre remaining unimpaired and the lustre of the silk increased, thereby enabling the manufacturer to use this silk into numerous fabrics, from which they have been heretofore debarred on account of its brown color. It would be well for manufacturers to give a trial order. This concern has made several lots for Robert J. Hoguet, president of the only conditioning house in the United States, and for the Catoir Silk Co. We understand the result has been eminently satisfactory, showing no loss whatever in bleaching and the loss in boiling off being the same as usual with dyers. Mr. Catoir says that the bleaching seems to be perfect, and the cloth woven from it caused no trouble on the loom, a weaver turning off 12 yards per day. This gentleman had some of this silk dyed in several light colors, also a beautiful black.

—The Crown Worsted Mills, Providence, R. I., are equipping their new mill throughout with humidifiers, placing a repeat order for the same with the American Moistening Company, of Boston, Mass.

—The American Moistening Company, Boston, have recently shipped one of their Fabric Dampeners to the Weybosset Mills, Providence, R. I.

—It is now nearly ten years since the B. F. Sturtevant Co. first began to design and build its own electric motors. Although originally designed solely for fan propulsion, these motors were soon built as independent machines, and to a still greater extent as dynamos for direct connection to Sturtevant engines. Today the Sturtevant generating set stands as well established as does the well known Sturtevant fan, and covers a field peculiarly its own,—that of the small set with high grade and high speed automatic engines.

—The New York Mills Co., New York Mills, N. Y., are extending their system of humidifiers, placing their order with the American Moistening Company, Boston, Mass.

—The American Moistening Company, Boston, Mass., have a large export order for Parras, Mexico, a complete installation of humidifiers for the Estrella Mills requiring over 100 humidifiers.

—The Elmira & Senaca Lake Railway Company are pushing the construction of their line. The American Engineering Company of Philadelphia, Pa., are the general contractors for the road, and have placed the order for the seventeen bridges required with The Berlin Iron Bridge Company, of East Berlin, Conn.

Heating and Ventilating.

It gives us much satisfaction to be able to lay before our readers the following testimonials regarding the heating and ventilating systems of the Buffalo Forge Company, Buffalo, N. Y., addressed to this company:

The Lozier Manufacturing Co., Westfield, Mass., say: "We have equipped all of our factories at Westfield, Mass., Thompsonville, Ct., and Toronto, Ont., with your heating and ventilating plants, and it is needless to say that we are more than pleased with the system at each and every point. We know of no better, the results being perfectly satisfactory."

Wyman, Partridge & Co., Minneapolis, Minn., write: "Last winter was a very severe one, and in fact the most severe one we have had for years past in this locality. We had no trouble in heating our building at any time. The heating and ventilation was perfect throughout the winter. We have used the fans to a limited extent for ventilation during the summer."

The Sherwin-Williams Company, Cleveland, Ohio, write: "We desire to say that the heating system installed by you last year was quite satisfactory. We are running it during the summer, not so much for cooling, as to get a circulation of air through our basement, all with entire success."

The Lodge & Shipley Machine & Tool Company, Cincinnati, Ohio, write: "We came into our building just previous to the extreme weather of last winter, which was the coldest for many years. The building was new, and, therefore, damp. We were running on a temporary boiler with barely sufficient steam to keep us going, and yet your heating apparatus, which we installed, gave us ample heat. In fact, we could have overheated the building without trouble."

The Bullock Electric Manufacturing Company, Cincinnati, Ohio, write: "Last winter was a very severe one for this part of the country, but throughout the entire cold weather we had no trouble at all with our heating plant. It gave us very good satisfaction."

The Brooks Locomotive Works, Dunkirk, N. Y., write: "The heating system installed by you for our new paint shop, we are pleased to state gave us no difficulty whatever in keeping the shop warm during the past winter. We can speak in commendatory terms of your system."

The Peoria & Eastern Railway Company, Indianapolis, Ind., write: "The heating plant put in by you is most satisfactory. In the latter part of February we had three days in which the thermometer registered 26 to 27 degrees below zero, and the shop buildings were all very comfortable during that period, notwithstanding they are located in an exposed place. On the warm days this summer, we have used the plant for cooling purposes, and the result is highly satisfactory.

—The Berlin Iron Bridge Company, of East Berlin, Conn., are erecting the extension for the power plant of the Hyde Park Electric Company, at Boston, Mass.

—The Gloucester Street Railway Company, of Gloucester, Mass., have placed the order for their new fireproof power house with The Berlin Iron Bridge Company, of East Berlin, Conn. The building will be absolutely non-combustible.

—The Graniteville Mfg. Co., Graniteville, S. C., are now having erected at their Vaucluse Mill a complete new picking plant consisting of openers, breakers, intermediates and finisher lappers, all of which are supplied by the Howard & Bullough American Machine Co., Pawtucket, R. I.

—The Kinston Cotton Mills, Kinston, N. C., have placed a repeat order for picking machinery with the Howard & Bullough American Machine Co., Pawtucket, R. I.

—The Howard & Bullough American Machine Co., Pawtucket, R. I., have just finished the erection of a large repeat order for picking machinery at the Grosvenor Dale Co., Grosvenor Dale, Conn.

—The Greenwoods Co., New Hartford, Conn., one of the leading duck mills, have just completed extensive alterations in their picking department. All of the new machinery was furnished by the Howard & Bullough American Machine Co., Pawtucket, R. I.

—Attention is called to the advertisement, in another column, of some Huse and Brinton & Denny knitters for sale, and other auxiliary machinery.

Ribbed Knitting Machinery for Sale.

A remarkably good opportunity is offered among the special machinery advertisements to secure first-class machinery for men's ribbed tuck stitch goods at 50 cents on the present list price. We understand the machinery is new style and in perfect condition.

—The Berlin Iron Bridge Company, of East Berlin, Conn., have the contract for furnishing the structural steel work for three buildings for the Ottawa Carbide Company, of Ottawa, Canada. The buildings are from 3 to 5 stories high, and consist of a furnace building 80 ft. wide and 286 ft. long, a grinding room 38 ft. wide and 90 ft. long, and a breaking room 35 ft. wide and 80 ft. long, and 2 stories high. The floors are carried on steel beams and columns, and the flooring is steel plate. The trusses have a clear span, and the roofing is corrugated iron. The bins for the storage of material are all of plate iron. No wood work is used anywhere in the construction of the buildings.

—A private telephone system has recently been installed in the silk mill of A. H. Rice & Co., at Pittsfield, Mass., by F. O. Plummer of 620 Atlantic Ave., Boston, to connect the various departments and the office. A private telephone system is becoming a recognized feature in the economical conduct of well organized mills. As financial propositions they have demonstrated themselves to be money savers, and as a convenience and time-saving device, their value is difficult to overestimate. Mr. Plummer has had a wide experience with mill installations and is prepared to give estimates and make suitable installations with the best equipment at reasonable figures.

Water Wheel Installations.

C. P. Bradway, of West Stafford, Conn., manufacturer of turbine water wheels, water motors and general mill machinery, has been very busy of late. Among some of his recent shipments are turbine wheels to Seymour, Smith & Co., Oakville, Conn.; Comstock Mfg. Co., Kalamazoo, Mich., and to Akers & Taylor of Charlton City, Mass. He has also recently installed a water wheel regulator for Daniel Curtis Sons, Woodbury, Conn., and for the Bristol Saw Works in Bristol, Conn., as well as a water motor for J. M. Maloney, Ware, Mass. At present he is building wheels for the Shetucket Worsted Mills, Baltic, Conn., and for Henry Glowsky, Bethlehem, Conn. Last fall Mr. Bradway built a wheel for Theodore Bird, who runs a small woolen mill at Bethlehem, Conn. Henry Glowsky has a mill just below and has been using the same kind of wheel that Mr. Bird formerly employed, which is a modern wheel and well advertised. He wrote Mr. Bradway on August 14, and we give abstract of letter as follows: "Please quote me price on wheel as good as Mr. Bird's. If you are not too high price, you will get the order. Mr. Bird's wheel is a good one It does the work with less water than my wheel, indeed, half the water. I would like to try the wheel before I pay you, but you shall not wait long if all right."

—The new foundry for the Benjamin Eastwood Company, at Paterson, N. J., is nearly completed. The building is designed and built by The Berlin Iron Bridge Company, of East Berlin, Conn. It is 92 ft. wide and 180 ft. long, with a traveling crane. The wings of the building being controlled by jib cranes. When done it will be one of the most complete foundries in the eastern states.

—The American Thread Company, of Holyoke, Mass., have placed the order for their new boiler house with The Berlin Iron Bridge Company, of East Berlin, Conn.

Beattie Machine Works.

A new illustrated catalogue has just been issued by the Beattie Machine Works, of Cohoes, N. Y., builders of the Beattie Patent Loopers, and is the only one of its kind devoted entirely to loopers. It contains much useful information regarding loopers, and will be mailed free to those who request it. This firm has on exhibition at the National Export Exhibition, at Philadelphia, Pa., several of their loopers containing their many improved and patented parts. They will be pleased to show the merits of their machines to any one who is interested in this class of machinery. These machines will be found at the Main Exhibition Hall, Section P, No. 8.

MILL NEWS.

Cotton.

New Mills.

—*Alabama, Florence. The new Ashcraft Cotton Mills, which were expected to have 2000 spindles, will be larger than at first intended, and will have 3000 spindles and 100 looms. This plant expects to start up March 1, 1900. Cyrus W. Ashcraft is president.

—Alabama, Huntsville. The Peoples Cotton Mill, which is the new co-operative company, has received subscriptions for $15,000 capital stock. It is expected that the balance will be subscribed within two or three weeks.

—Alabama, Norwood. A new cotton mill company has been organized here, with the following officers: D. A. Gayden, president; M. A. West, superintendent; M. C. Bridges, treasurer. Capital stock will be $50,000. Over $26,000 have already been subscribed.

—*Alabama, Sylacauga. The McDonald Cotton Mills will probably not be finished and ready to start before June, 1900. A new building will be built. The product will be cotton yarns. It is intended to put in 5000 spindles at the start, although they may be increased to 10,000; steam power. The capital is to be $150,000. Interested parties are: J. B. McDonald, J. E. Pearson, and others.

—*Alabama, Wyeth City. J. A. McKinstry informs us that a cotton mill enterprise is contemplated, but he is not yet able to give us particulars.

—*Georgia, Atlanta. John A. Perdue, of Atlanta, informs us that his new cotton mill will probably be started up in the spring of 1900, employing 225 hands, making ducks, sheetings, or colored goods; 5000 spindles and about 170 looms; steam power. J. D. Rhodes and A. G. Rhodes are interested with him in this project.

—Georgia, Baconton. Among the interested parties in a proposed new cotton mill for this place are M. E. Jenkins, L. A. Brooks, J. S. Miller and R. J. Bacon.

—*Georgia, Canton. Robert T. Jones, who is one of those interested in the new cotton mill here, informs us that a subscription paper is now being circulated, and that $65,000 has already been sub-

scribed. The proposed capital is $100,000, and he thinks within 30 days the total will be subscribed. Definite plans regarding a new mill and its product have not as yet been decided upon.

—*Georgia, Carrollton. The Mandeville Cotton Mills, recently organized with a capital of $100,000, L. C. Mandeville, president and treasurer, expect to start work on their new building October 1, and to have the plant in operation April 1, 1900. It will start with 6000 spindles and 200 looms; steam power. Product will be fine yarns and sheetings, 40 in. wide, 68 by 72, 4¾ yards to the pound.

—*Georgia, Cedartown. J. Wright Adamson, secretary of the Cedartown Cotton Co., informs us that while it is true that Philadelphia capitalists are intending to establish a new cotton mill here, to be under the management of the Cedartown Cotton Co., the entire matter is in such indefinite shape that it is impossible to give any further details at present.

—*Georgia, Columbus. The Columbus Manufacturing Company expects to start work on the foundations of its new building October 1. The company now has $225,000 capital. President, F. B. Gordon, Columbus, Ga.; treasurer, Chas. H. Utley, Boston; selling agents, N. Boynton & Company, Boston. The mill will probably start production in May, 1900, with 10,000 spindles and 320 looms; electric power; product, brown sheetings and drills.

—Georgia, Dalton. There is a report that the Crown Cotton Mills will put up another mill at a cost of about $100,000. The company now operates 20,000 spindles and 500 looms, with a capital stock of $163,000.

—Georgia, Florence. Capt. W. H. Day is interested in the establishment of a new cotton mill here, to have 10,000 spindles. Capital is to be about $135,000.

—*Georgia, Hartwell. E. S. Benson, recently mentioned as interested in the proposed new cotton mill here, informs us that this company will probably not be fully organized before next year. The name has not yet been decided upon. The intention is to build a mill for making shirtings, sheetings, etc. The location is to be on the Tugalo River, as recently mentioned.

—*Georgia, Hogansville. The Hogansville Manufacturing Company, which is a new company recently chartered, is to have a capital of $80,000. President, R. J. Griffin; treasurer, Judson Mobley; superintendent, George W. Murphy. The foundations for the mill have already been started. It will have 5000 spindles, with 60 looms; steam power. The product will be heavy duck. We understand that the looms have not been bought.

—*Georgia, Jefferson. We are informed by the Jefferson Cotton Mills that their new plant will be built at once. This company has $60,000 capital. President, H. W. Bell; manager, J. C. Turner; secretary and treasurer, Frank Roberts.

—Georgia, Juliette. The new cotton mill is now nearing completion. It will have 5000 spindles, water power. Macon capitalists are back of the project.

—Georgia, Macon. A new cotton mill company has been established here, known as the Ocmulgee Cotton Mills; capital stock $100,000. Those interested are J. W. Cabaniss, Sam'l Mayer, N. M. Block, H. J. Lamar and G. L. Snowden.

—*Georgia, Pelham. The Pelham Manufacturing Company, recently organized to build a new mill, informs us that they expect to have the plant ready to start up by July 1, 1900, employing about 75 hands. The product will be 4/4 brown sheeting; 5000 spindles; 160 looms; steam power; $100,000 capital. J. E. Hand is president. Mr. Hand is also president of the Hand Trading Company, of Pelham, Ga. Other interested parties are B. U. Curry, J. M. Hurst, M. Wilkes, and others. The site is now being prepared and a dam constructed. The mill will be 105 by 175, two stories. Work will start on this about January 1.

—*Georgia, Social Circle. Efforts to establish a cotton mill company have resulted in the organization of a new company with $100,000 capital. President, Joseph Blasingame; vice-president, J. B. Robinson.

—*Louisiana, Clinton. The new mill here will be known as the Clinton Yarn and Cotton Mills, authorized with a capital of $100,000. The organization committee consists of Isadore Mayer, I. L. Heyman, H. H. Forrester and George R. Ramsey. The building they will use was erected for another purpose some years ago, at a cost of $20,000. Machinery has been purchased. The product will be yarns, but they propose to add later machinery for the manufacture of osnaburg, duck, etc. The machinery will probably be started in January, 1900, with 2000 spindles; steam power; employing about 80 hands.

—*Louisiana, Hammond. We are informed by the Hammond Real Estate & Improvement Company that $35,000 has already been subscribed for a $50,000 cotton company, to be known as the Hammond Cotton Manufacturing Company, the product to be Osnaburgs. A new mill will be built, employing about 150 hands; steam power. C. E. Cate is chairman of the executive committee.

—Louisiana, Norwood. A new cotton mill is proposed for this place. Among the interested parties are Dr. A. Gayden and W. A. West. Capital stock is to be $50,000.

—Louisiana, St. Francisville. A cotton mill project is being agitated here. L. P. Kilbourne, Thomas Butler, W. H. Barrow, and others, are on a committee to investigate.

—Maryland, Baltimore. The press of this city reports that James E. Hooper, of the firm of William E. Hooper & Sons, who operated the Woodbury Cotton Duck Mills before the combination was made, intends to establish a new cotton duck mill in this vicinity, although nothing definite in regard to this new project has been given out.

—*Massachusetts, Taunton. The new cotton mill here will be known as the Winthrop Yarn Mill. President, Chas. L. Macomber; treasurer, Abbott F. Lawrence. Directors, Franklin D. Williams, Frank L. Cady, Abbott Lawrence, Chas. L. Macomber. The contract has been let for the building, and work will be started immediately. It is expected that the plant will be finished early in 1900.

—Mississippi, Columbus. T. O. Burris is reported as endeavoring to establish a cotton mill here.

—*Mississippi, Jackson. The Jackson Textile Co. has been organized with a capital of $100,000, to build a cotton mill. This is probably the same project that W. A. Gunning was interested in last June, which we mentioned then.

—*Mississippi, Laurel. The Laurel Cotton Mills have now been incorporated. Capital stock, $200,000. The incorporators are W. B. Rogers, George S. Gardiner and others. It is proposed to build a 15,000-spindle mill with 500 looms.

—*Mississippi, McComb City. The McComb City Cotton Factory was organized last week with a capital stock of $100,000, all of which has been subscribed. Capt. John J. White is one of the officers and L. W. James is secretary. The mill will have 10,000 spindles and 150 looms.

—*Mississippi, Okolona. R. W. Chandler, one of the interested parties in the proposed Okolona Cotton Mills, informs us that it is impossible to give definite information as yet. It is probable, however, that E. S. Elliott will be president of the new company and T. L. Bramlett, treasurer. It is not expected to start work on the plant until next spring. It will be a cloth mill.

—Mississippi, Vicksburg. A new cotton mill company is proposed for this place, to have $125,000 capital. Subscriptions to capital stock will be received up to October 1. The committee having this matter in charge includes Murray F. Smith, B. W. Griffeth and eight others.

—*Mississippi, West Point. We are informed by J. A. McArthur, president of the West Point Cotton Mills, that the company has bought 70 acres of land, and has let the contract for brick, to be made on the land. It is expected that this new mill will be built and running by the summer of 1900, making 30s to 40s two-ply yarn, with 5000 spindles.

—*New Hampshire, Penacook. The officers of the New Hampshire Spinning Mills have been elected as follows: President, Marcellus Gould; treasurer, H. M. Cavis; agent and superintendent, Marcellus Gould. The mills of the Contoocook Manufacturing Company have been purchased and will be thoroughly refitted with 18,000 new spindles. The product will be high grade combed yarns, fine numbers, employing about 125 hands; water power. The product will be sold through the American Cotton Yarn Exchange, of which Arnold B. Sanford is manager. An order has been placed for machinery. The mill is now being raised and an addition made.

—North Carolina, Cronley. J. Howard Sykes is endeavoring to organize a new cotton company here to build a mill of 5,000 spindles. $20,000 has already been subscribed.

—North Carolina, Durham. The Erwin Cotton Mills Co. is having locations for two new mills surveyed by Chief Engineer J. H. Hayes and assistants. These are to be located on the Haw River in Alamance Co., N. C.

—*North Carolina, Durham. It is now reported that Julian S. Carr has organized a company with $400,000 capital, to build a mill here. The president of the company will be T. B. Fuller; vice-president, George W. Watts; directors, Mr. Carr, Rufus L. Patten and others.

—North Carolina, Gastonia. It is reported that George A. Gray and John F. Love, prominent business men here, are interested in a large new cotton duck mill, to manufacture export goods especially.

—*North Carolina, Kings Mountain. W. A. Mauney informs us that his new cotton mill here will not be started until next spring. The lumber is to be sawed this winter.

—*North Carolina, Kings Mountain. The Lulu Manufacturing Co., mentioned recently as at Gastonia, is to build a mill here, with 2500 spindles, for making coarse yarns for hosiery. The capital stock is $100,000; president, P. S. Baker; treasurer, D. M. Baker; superintendent, N. W. Shealy. The plant will probably be ready to start next April.

—North Carolina, Louisburg. J. S. Barrow is reported as interested in a new mill here to manufacture cotton rope and twine. He would like to hear from manufacturers of such machinery.

—*North Carolina, Mt. Pleasant. The name taken by the new cotton company here is the Tuscora Cotton Mills, capital $35,000, privilege of increasing to $100,000. The following officers have been elected: J. W. Cannon, Concord, president; Rev. Paul Barringer, secretary and treasurer.

—*North Carolina, Newton. Parties considering a new cotton mill here have incorporated the Catawba Cotton Mill with a capital stock of $25,000. The incorporators are John P. Yount, Robert B. Knox and Edward P. Shrum. At the start this plant will probably have 1500 spindles, which have already been contracted for.

—*North Carolina, Sanford. The Sanford Cotton Mills, recently incorporated, will be built at once. Foundations have already been started. The mill will be equipped with 10,000 spindles and 500 looms. Half of this equipment will be put in at the start. The capital is $100,000. Thomas L. Chisholm is manager.

—North Carolina, Spray. A charter has been granted to B. N. Duke, J. B. Duke, and others, for a $100,000 company. The capital is all paid in, and another cotton mill will be established here.

—Quebec, St. Henri. This town has agreed to exempt from taxation a new cotton mill which the Merchants Cotton Co. proposes to build, to have 20,000 spindles for making hosiery yarns and 500 looms for weaving cotton print cloths. This new building will be about 300 feet long, four stories, and will employ about 300 operatives, with an annual pay roll of at least $50,000.

—*North Carolina, Wilmington. Machinery has commenced to arrive for the new Delgado Cotton Mills. It is expected that the plant will be running about February 1.

—North Carolina, Wilson's Mills. The Anthony Cotton Mills have been organized to build a plant and make yarns. Start will be made with a small equipment.

—*South Carolina, Columbia. The small new mill mentioned recently will be called the Capital City Mills. It will have about 6200 spindles, electric power and product will probably be 3-yard

sheetings. Work on foundations will probably start October 1, and the plant will be running by March, 1900. W. B. Smith Whaley & Co. are the engineers and architects.

—*South Carolina, Hickory. The new mill at this place, in which Col. J. R. Ashe of Yorkville, S. C., and R. M. Carroll of Blairsville, S. C., are actively interested, has been incorporated as the Marie Mills. Capital stock, $50,000.

—South Carolina, Liberty. William Hunter, Sr., informs us that he has already received about $75,000 for subscription to capital stock of a new cotton mill to be erected near Liberty.

—*South Carolina, Westminster. W. E. Cheswell has organized a new company here with $100,000 capital, to be known as the Cheswell Cotton Mill Co. Among those interested with him are Campbell Courtney of Newry, S. C., W. P. Anderson and W. J. Carter of Westminster.

—*Tennessee, Jackson. Thomas Tate, who is interested in the new cotton mill here, informs us that he does not expect to have this plant built until July, 1900. He will probably have 3000 cotton spindles and 200 looms; steam power; $75,000 capital. Organization of the company has been delayed on account of inability to get machinery before the early summer of 1900.

—Tennessee, Kosciusko. A new cotton mill company will be organized here, with $100,000 capital stock. Officers have been elected as follows: C. C. Kelly, president; F. Z. Jackson, vice-president; Walter Burgess, secretary and treasurer. $75,000 has already been subscribed, and it is expected that land will be purchased soon and work started in.

—Texas, Denison. We note the incorporation of the American Cotton Spinning Co. at this place, with a capital stock of $100,000, by J. A. Smith, Hiram Brooks and B. M. Seward.

Enlargements and Improvements.

—Georgia, Columbus. The additional stock of the Eagle & Phoenix Mills, $150,000, has been oversubscribed to the extent of double this amount.

—*Georgia, La Grange. L. M. Park & Sons, who are now the sole owners of the Park Mills, and are now making sheetings, shirtings, ducks, drills and yarns, inform us that an addition is to be built and that the power plant is to be enlarged.

—*Georgia, Monroe. The stockholders of the Monroe Cotton Mills have voted in favor of the extensions proposed last month, and it is understood that this work will be started immediately. $50,000 of new stock will be issued and 180 new looms added.

—*Georgia, Newnan. The Newnan Cotton Mills, whose extensions we mentioned last week, inform us that they are to add 3700 new spindles, which will give them a total of 10,000. They hope to have the addition ready and the machinery running in the early part of 1900. The product is white and colored hosiery yarns, Nos. 5 to 20s, ball sewing thread, white and variegated wrapping twine.

—*Maine, Lewiston. The Libbey & Dingley Co. was recently organized here with $300,000 capital. President, H. M. Dingley, and treasurer and agent, W. S. Libbey. About 20,000 new spindles are to be put into the plant, which will employ about 250 hands, making staple white cottons, numbers 40 to 60.

—Massachusetts, Amesbury. The Hamilton Woolen Co. will fit up the third floor of No. 7 mill on Main St. with 100 new looms.

—Massachusetts, North Adams. The Williamstown Mfg. Co. will change over its machinery to make fancy cottons. At present they are making some plain cotton goods. An electric lighting apparatus will soon be put in.

—Massachusetts, Lowell. The Appleton Co. has let contract to C. H. Nelson for an addition to No. 6 mill on Jackson St., to be 92 by 97. This will enable them to enlarge the napping and cloth room and furnish more storage capacity.

—*Massachusetts, New Bedford. The addition which will be built by the Pierce Manufacturing Company, will be 302 by 111, three stories, brick. Architect F. P. Sheldon, and as recently mentioned, J. N. Bishop, of Providence, has the contract.

—*New Jersey, Millville. The Millville Manufacturing Company, which is building an addition, expects to have same ready to start next winter. The building is for a weave shed, to enlarge their present capacity. They have not yet determined upon the new equipment to be put in. J. K. Russell is agent. The building will be of brick, 206 by 229, two stories.

—*New York, Utica. We have confirmation of our recent report from the Mohawk Valley Cotton Mills. They will add two stories to extension of Mill No. 2, which extension is now only two stories in height, which will be of brick, 134 by 101. This will enlarge the carding and spinning departments, and also increase their product. The enlargement will be completed by December 1. Machinery has been ordered.

—*North Carolina, Norwood. The Norwood Cotton Mills inform us that they are to add 2600 new spindles and that machinery has been purchased. At present they operate 5000 spindles.

—*North Carolina, Spray. The Spray Cotton Mills are completing an addition to their mill, 94 by 103, to be equipped with carding and spinning machinery.

—*North Carolina, Spray. The Leaksville Cotton Mills have just completed an addition 75 by 80, three stories, and are putting in 200 looms. They are now building a new boiler and engine house.

—South Carolina, Clifton. The Clifton Mfg. Co. will put in about $250,000 in improvements to their plant. This will include a new building with 15,000 more spindles, which will give them a total of 111,792 spindles and 3200 looms. Contract for this new building has been let to Alexander Gibson and J. C. Cooksey. Work on building will be started at once.

—South Carolina, Clover. The Clover Cotton Manufacturing Company will increase its plant from 6000 to 10,000 spindles.

—South Carolina, Greenville. It is reported that the American Spinning Co.

will increase its capital stock from $125,000 to $350,000, and will put up a new mill, 120 by 250, four stories, to contain 10,000 spindles and 500 looms. J. H. Morgan, president of the company, is reported as not willing to confirm this report, although not denying it.

—South Carolina, Lancaster. The Lancaster Cotton Mills will increase their capital stock from $150,000 to $1,000,000. About 50,000 spindles will be put in. Their present plant consists of 10,500 spindles. Leroy Springs is president.

—South Carolina, Lando. The Manetta Mills, now operating 5000 spindles, will increase their capital stock from $40,000 to $100,000.

—*South Carolina, Rock Hill. The Crescent Cotton Mills, which is a new company organized to operate the old Rock Hill Mill, will issue $50,000 in bonds for improvements, and put in 8500 spindles, 20 cards, boiler, engine, etc. The equipment is now 7904 spindles and 192 looms. Directors are A. H. White, W. C. Hutchinson, and others.

—Virginia, Petersburg. The Pocahontas Mills are putting in 15,000 new spinning spindles.

Mills Starting Up.

—*Alabama, Selma. The purchasers of the Selma Cotton Mills have organized a new company to be known as the Estelle Cotton Mills Co. President, O. F. Cawthon; vice-president, A. W. Cawthon; secretary and treasurer, R. H. Mabry; superintendent, T. L. Wainwright of Stonewall, Miss. Equipment is 5000 spindles and 144 looms. There is room for 5000 more spindles, which will be installed in the near future.

—*Connecticut, East Killingly. A. G. Bishop, Jr., East Killingly, Conn., is proprietor of the old Ross Cotton Mill at Chestnut Hill. Its equipment consists of 6000 spindles and 104 looms. Product is print cloths and sheetings.

—*Georgia, LaGrange. The new building of the LaGrange Cotton Mill has been completed and 5000 spindles will be put in ready to start up November 1. This will give the plant 10,000 spindles.

—Louisiana, New Orleans. The old Semmes & Parker Cotton Mill at this place has been leased by Louis Kohlmann, who will expend about $45,000 on improvements and start up the plant with 2400 spindles.

—Massachusetts, Millbury. F. H. Rice of Worcester confirms our recent report that he has leased the Millbury Cotton Mills. He has taken his son as a partner, and will operate the plant under the name of Edward F. Rice & Co. Print cloths will be made.

—Massachusetts, New Bedford. The Beacon Mfg. Co., whose plant has been shut down for about three months, has now started up. Their product is cotton carpet and hosiery yarns. The Mt. Pleasant Mills are now under their control. Edgar Eaton, formerly of the Oneko Woolen Mills, New Bedford, is superintendent.

—Rhode Island, North Kingston. The four mills of the Rodman Co., located at North and South Kingston, which have been closed for more than a year, will start up October 9. Their product is jeans.

Mills Shutting Down.

—Massachusetts, North Dighton. The Mt. Hope Mill at this place, which is now owned by the yarn trust, will be shut down and its machinery may be consolidated with that of one of the larger plants of this company.

Woolen.

New Mills.

—*Maine, Springvale. The new woolen company here will be known as the Springvale Woolen Co. A charter has been granted for $500,000 capital, $6200 of which has been paid in. President, E. E. Goodwin; treasurer, H. O. Witham; superintendent, Frank R. Bean.

—Massachusetts, Millbury. T. L. Chase of Worcester has bought the C. T. Aldrich, Jr., shoddy mill property at Wilkinsonville. There is a good water power included. The mill and most of the tenement houses were burned a year or two ago. It is expected that the mill will be rebuilt and started up.

—*Michigan, Alma. H. W. Moore is the party who is to start a one-set woolen mill here. The product is to be blankets, flannels and yarns. He will have four looms, four knitting machines and dyeing equipment. The machinery is the same as was located at Lowell, Mich. The plant will not be running before next April.

—Pennsylvania, Philadelphia. Sheck & Goodman, who recently established their new mill at the corner of Howard and Palmer Sts., with 50 new Crompton & Knowles looms, for the manufacture of damask and Venetian stair carpets, will soon have the plant running.

—Pennsylvania, Philadelphia. William G. Collins (plush manufacturer), will build a large mill at Umbria Street and River Road, Manayunk, brick, iron and stone, 140 by 100. The contract has been awarded to John Stimler, 4118 Manayunk Ave., Manayunk. The cost of this building is to be about $15,000.

—*Pennsylvania, Worthington. Peter Graff & Co. inform us that work was started on their new mill August 1. They expect to have the entire plant running by April 1, 1900, employing 60 hands. They will make, as formerly, blankets, flannels, skirtings and yarns. It will be remembered that their entire plant was destroyed by fire last May. They will put in two sets of 60 in. cards, with ten wide and six narrow looms; steam power. Members of this company are: F. D. Graff, J. Frank Graff and James E. Claypoole.

Enlargements and Improvements.

—*Connecticut, Baltic. M. H. Donohue, proprietor of the Shetucket Worsted Mill, has let the contract to James Picknell, Willimantic, Conn., for an addition to his mill, 125 by 60. The product will be worsted and woolen goods.

—Connecticut, Glastonbury. The Crosby Manufacturing Company is adding a four-story addition to its mills, to provide for four sets of new cards. Their present equipment is for a seven-set mill.

—Massachusetts, Holyoke. Beebe, Webber & Co. will set up and operate

twenty looms in a room rented by them in the Whitcomb Bldg. This is in addition to their mill here, which at present is very busy.

—*New York, Jamestown. The Chatauqua Worsted Mills confirm our recent report, and inform us that the property of the Wyckoff Harvester Company, which they have purchased, will be used for a top mill, and that their carding department will be moved into these buildings. This will give them room in the old mill for another set of drawing and 1600 worsted spindles, all of which is ordered. They hope to have same running before the first of the year.

—*North Carolina, Albermarle. The Windmere Knitting Mills have awarded the contract for their building, which will be 75 by 100, three stories. Their machinery capacity will be 100 pairs of hosiery per day. It is expected to be ready by the middle of October.

—Ohio, Cleveland. The woolen mill operated by the Beckman Co. will be enlarged by an extension to the main building. 100 new broad looms will be put in and other machinery. A new boiler house has recently been built and equipped with a 500 H. P. engine.

—*Ohio, Cleveland. The Turner Worsted Company confirms our report that an addition is being built 70 by 80, three stories, and that two sets of worsted cards will be put in. This will be running in December, employing about thirty more hands. This will give them a total of 5 sets of cards, six combs, 300 looms and 4200 worsted spindles. The company has $400,000 capital. The president is M. Stafford; treasurer, Kaufman Hayes; agent and superintendent, G. H. Hodgson.

—Rhode Island, Pawtucket. The Royal Weaving Co. will increase its capital stock from $300,000 to $600,000. President, D. L. Goff; treasurer, Charles E. Pervear; agent, Joseph Ott.

—Rhode Island, Woonsocket. Mr. Harding's interest in the firm of Harding & Gilleran, worsted manufacturers on South Main Street, has been purchased by Henry Sayles, of Blackstone, who will become a partner with Mr. Gilleran. Enlargements will be made at the plant.

Mills Starting Up.

—*Connecticut, Greenwich. The Rippowam Mfg. Co. is the name of a new company organized to operate the Rippowam Mills. It has $25,000 capital. President, Thomas I. Raymond; treasurer, agent and superintendent, Fred A. Springer. The mill will be started October 1. It has three sets of cards and seventeen looms, and will make plush carriage robes, horse blankets and plush novelties. This mill was built in 1895.

—Connecticut, Thompsonville. Worsted Department No. 1, of the Hartford Carpet Company, which has been idle for over a year, has now been started up, employing 100 hands.

—*Maine, Dexter. A charter has been granted to the Wassookeag Woolen Co. Capital stock, $40,000. The officers will soon be elected. This company will operate the brick mill.

—*Massachusetts, Dalton. Andrews & Reddick, now proprietors of the Hampden Woolen Mill, started the plant September 1, with 100 hands. The product is worsteds and Scotch novelties. They have put in six new looms, and now have 36, with seven sets of cards. The product will be sold direct. E. M. Andrews is at present a member of the New York firm of Dudley, Battelle & Hurd, and it is expected that he will retire from that firm January 1. The plant is now running on full time, and it is probable that the carding, spinning and weaving will soon be operated day and night.

—*Massachusetts, Millbury. C. T. Aldrich's satinet mill will start up October 1st. This plant has been idle for about three months. Repairs have been made.

—*New Hampshire, Tilton. O. & E. Morrison conform our recent report that they have leased the Buell Mill, and will run it in connection with the Elm Mills Woolen Company, making the same line of goods.

—Rhode Island, Coventry. Joseph Dews, proprietor of the Livingstone Woolen Mills, Washington, R. I., has secured the Coventry Worsted Co.'s plant, and expects to start same early in October. He is putting in some new machinery.

—Rhode Island, Tarkiln. The Oak Valley Woolen Mill has been leased by Herbert Mowry and his brother. This plant has five sets of cards, and is equipped for making fancy cassimeres. The mill has been idle since last July.

Knit.

New Mills.

—*North Carolina, Albermarle. The Windemere Knitting Mills have been incorporated with a capital of $30,000, all paid up. J. W. Cannon and others are incorporators. As recently reported, contract for their new building has already been let, and the building will probably be finished this fall.

—*North Carolina, Raleigh. We have a letter from H. B. Greason, who was mentioned as interested in a new knitting mill at this place. He is superintendent of the Raleigh Cotton Mills, and informs us that while they are contemplating building a knitting mill for making underwear, as yet they have taken no active measures. It is certain, however, that the project will go through, and that the plant will have $25,000 to $50,000 capital.

—Pennsylvania, Ambler. George L. Sassaman & Sons, who formerly operated a knitting mill at Oreland, Pa., have had plans made for a building 55x82, three stories, to be built here. The product will be woolen and cotton hosiery. Estimated cost of this building, $15,000.

—*Pennsylvania, Newville. Plans for the mill of the Newville Knitting Co. have been prepared by Architect J. C. Dempwolf of Centre Square, York, Pa. The building is to be 48 by 200, four stories, brick and iron, with elevators.

—Pennsylvania, Reading. The Hampden Knitting Mill will probably build a new plant on No. 11th Street, between Spring and Robeson. They have bought

land 85 by 110. A three-story factory will be started very soon, which will be 40 by 60, with boiler and engine houses. The present quarters of the company are too small to accommodate more machinery, and it is proposed to enlarge the equipment. Twenty-three hands are now employed, and it is expected that nearly 100 will be employed in the new mill.

—*Virginia, Berkley. The Berkley Knitting Mills inform us that they expect to have their new building and machinery running by November 1, 1899. The product will be ladies' ribbed vests, employing about 40 hands; steam power. They will have ten machines. This company has $25,000 capital, and is in the market for considerable new machinery.

—*Virginia, Newport News. Reverdy Stewart is proprietor of the Stewart Knitting Mill, to be started up next spring, the product to be ladies' ribbed underwear. He informs us that he will have 20 machines, and that nearly all of them will be new. He sells his product through Lockwood & Company, 43 Leonard St., New York.

Enlargements and Improvements.

—Iowa, Iowa City. The Pioneer Knitting Works, J. H. Guzeman, proprietor, will build an addition, costing about $25,000. This plant now employs about 500 hands.

—*New York, Oswego. Frederic Conde has let contract to A. H. Smith for the addition to his knitting mill. It is understood that Mr. Conde has secured land adjoining his present mill and that the addition will be 40 by 120, five stories, of slow burning construction.

—*North Carolina, Winston. The Winston Knitting Mills, which were recently incorporated, expect to build a new structure. This plant started operations in October, 1898, making ladies', children's and men's ribbed underwear. They now operate five knitting machines; electric power. The addition will give a total of 14 machines. At present their capital is $60,000; president, M. D. B. Bailey; treasurer, J. T. Wilson; secretary, Fred Bailey; superintendent, C. M. Whitbeck.

Mills Starting Up.

—New Hampshire, Laconia. The Laconia Knitting Company, O'Shea Bros., proprietors, manufacturers of worsted and cotton hosiery, have started up. The mill has been idle since 1893.

—*New York, Amsterdam. It is reported that J. K. Stewart, who last July bought the Spartan Knitting Mill, will put the plant in operation. It is a four-set mill, employing about 100 hands when running.

—*New York, Nyack. The new plant of the Nyack Knitting Co., incorporated last January, has been started up in the Ernst Bldg. W. H. Brayton is manager. Power is furnished by a gas engine.

Silk.

New Mills.

—New Jersey, Paterson. Joseph A. Claxton and William Laird will start up a small silk weaving plant in the Hamilton Mill on Mill St. Both of these parties have been for many years employed by Joseph Fairhurst.

—*North Carolina, Fayetteville. The Ashley & Bailey Co. has its new mill here ready to start up; to be operated by colored labor.

—*North Carolina, Roanoke Junction. The Paterson Textile Co. has recently let contract to M. Burton of Richmond, Va., and Driscoll & Emery of Roanoke Rapids, for its new silk mill; buildings to be completed in December. 250 looms will be put in at the start. It is expected that this will be increased to 500 later.

—*Pennsylvania, Bethlehem. The small new silk plant here is to be known as the Union St. Silk Co., Hohrath & Fickert, proprietors, 8 Union St. The company has $1500 capital. Product will be ribbons; 10 looms. Machinery will probably be started September 25.

—Pennsylvania, Denmore. The Jenkins & Powell Silk Mill Co. is a new concern which will start work on its new building at once, and it is hoped to have machinery running by January 1, 1900. The mill will be located at the corner of Sherwood Ave. and Reaves St., will employ 150 hands, and be of brick, 75 by 200. The leading stockholders are Ex-County Recorder Jenkins of Greenridge, Pa., and Burgess Powell.

—*Pennsylvania, Hazelton. The contract has been let for the Dupian Silk Company's plant. The building will be 300 by 400, and work will be started at once. Bennett & Rothrock have the building contract, which will amount to about $100,000.

PERSONAL RECORD.

Cotton.

—G. T. Anderson has accepted the position of overseer of carding at the Millbury Cotton Mills, Millbury, Mass.

—F. L. Allen, formerly at the Maginnis Mills, New Orleans, has accepted a position of second-hand in the weave room of the Indian Head Mills, Cordova, Ala.

—Louis E. Bentley, for many years superintendent of the Bennett Spinning Co., is now general manager of all of the cotton yarn mills in New Bedford controlled by the New England Cotton Yarn Co., recently organized.

—A. H. Bosworth, for the past year in charge of the Millbury Cotton Mills, Millbury, Mass., has resigned to take a

position as overseer of the carding room of the Rodman Mfg. Co., at Allenton, R. I. Arthur Hall has taken Mr. Bosworth's place at Millbury.

—Walter M. Brooks has resigned as overseer of spinning for the Arasapha Mfg. Co., Chester, Pa., to accept the superintendency of the mill of Morris & Co., Yardville, N. J.

—G. S. Brigham, head bookkeeper for the Hargraves Mfg. Co., Fall River, Mass., has resigned.

—W. J. Brown, for the last five years second-hand in the weaving department of the Barnard Mill, Fall River, Mass., has accepted a similar position in the Flint Mill, of that city.

—Mark B. Creed, formerly of the Grinnell Mills, New Bedford, has succeeded E. H. Rooney, who recently resigned as general second-hand of carding in the Wamsutta Mills Nos. 1 and 2, New Bedford, Mass. The employes presented Mr. Rooney with a gold watch and charm upon his taking leave.

—W. B. Cole, superintendent of the Cabarrus Cotton Mill, Concord, N. C., recently resigned. The operatives at the mill presented him with a valuable ring.

—J. S. Davis, superintendent for ten years at the Meriton Mill, St. Catharines, Can., has recently gone to Hope Mills, N. C., where he has a similar position with the Hope Mfg. Co.

—J. J. Ellis has been promoted to the position of second-hand in card room at the Grendel Mills, Greenwood, S. C.

—T. H. Fairchild is now overseer of carding and spinning at the Edgefield Cotton Mills, Edgefield, S. C., day time and W. A. Hope at night.

—John W. Greenwood, who has been employed for a number of years at the Lancaster Mills, Clinton, Mass., has resigned and gone to Greensboro, N. C., to take charge of the finishing department of the Southern Finishing & Warehouse Co.

—Walter Griffiths is now engineer for the Eddy Mfg. Co., Fall River, Mass. He was formerly engineer at the Troy Mills.

—J. F. Gainer has changed from the Blue Spring Mills, Oxford, Ala., to the Eufaula Cotton Mills, Eufaula, Ala., as overseer of weaving, spooling, warping, slashing and drawing in.

—Nathan Howe, who has been manager of the Glasgo Thread Co. for a number of years, has been engaged to manage the new thread mill of Floyd Cranska, at 70 Beacon St., Worcester, Mass.

—J. W. Hawks has secured the position of boss spinner at the Edna Cotton Mills, Reidsville, N. C.

—Ex-Superintendent Ivey has been appointed to take charge of the mechanical department of the Raleigh Textile School, Raleigh, N. C.

—E. B. Lovell has accepted the position of head bookkeeper for the Hargraves Mfg. Co., Fall River, Mass.

—George Lovell has been appointed head bookkeeper for the Parker Mills, Fall River, Mass.

—John R. Mason, formerly superintendent of the Laurel Lake Mills, Fall River, Mass., has secured the position of superintendent of one of the Harmony Mills, Cohoes, N. Y.

—William R. Myers, overseer of the finishing room at the Lowell Bleachery, Lowell, Mass., has severed his connection with that concern

—James McNabb, loom fixer at the Barnard Mfg. Co.'s mill, Fall River, Mass., has been appointed second-hand of weaving at the mill.

—Henry J. McDermott has resigned as overseer in the waste department of Harmony Mill No. 3, Cohoes, N. Y.

—W. H. Mills, formerly with the Draper Co., Hopedale, Mass., has been appointed second-hand in the weave room of the Maginnis Mills, New Orleans, La.

—William Nolan is now overseer of weaving at the Louise Cotton Mills, Charlotte, N. C.

—Charles O'Gara, boss carder at the Nemasket Cotton Mills, Taunton, Mass., has resigned.

—T. O'Malley, formerly with the Richard Borden Mills and Sanford Spinning Co., has accepted a position as second-hand in the carding room of the Shove Mill, Fall River, Mass.

—Charles Prew, for over two years overseer of carding for the North Dighton Cotton Co., North Dighton, Mass., but later with the New England Yarn Co., has resigned to accept a position in the card department of the Mason Machine Works, Taunton, Mass.

—Charles H. Robbins, formerly boss carder with the Willimantic (Conn.) Linen Co., has accepted the position of assistant superintendent of the Hadley Mills, Holyoke, Mass. Murray R. Scott has succeeded him as boss carder at Willimantic, Conn.

—Frederick J. Snell, for 14 years overseer in the carding room at the Troy Mills, recently resigned to undertake his new duties as overseer of the carding room at the Richard Borden Mills, Fall River. Mr. Snell was presented with a handsome desk and bookcase as a slight token of the esteem in which he was held at the mills.

—L. F. Sherman, of Biddeford, Me., has accepted a position with the Lowell Machine Shop, Lowell, Mass.

—P. L. West has been appointed superintendent of the Eufaula Cotton Mills, Eufaula, Ala.

—J. B. Wright, overseer of carding for the American Spinning Co., at Greenville, S. C., has resigned and is now engaged as overseer of carding for the Clinton Cotton Mills, at Clinton, S. C.

—J. A. Wiley, after four years' service as overseer of weaving at the Nantucket Mill, Spray, N. C., has resigned.

—Henry Williams, overseer of carding at the Cohannet Mills, in Taunton, Mass., has resigned to become superintendent of the Nemasket Mills. The employes presented him with a solid gold chain and Knight Templar's charm, and a meerchaum pipe.

—John L. Young has accepted a position as overseer of the spinning at the Millbury Cotton Mills, Millbury, Mass.

Woolen.

—Frank Burk has returned to his position of boss spinner of the Elm Woolen Mills Co., Tilton, N. H.

—E. Craven, superintendent of the Columbia Worsted Mill, Wallingford, Pa., has resigned and Mr. Coe has accepted the position.

—John Clevette, boss weaver in the Merrimac Woolen Mills., Dracut, Mass., has resigned and secured a similar position in the Peck Woolen Mills, Pittsfield, Mass.

—George Dunham, formerly overseer of spinning with the Middlesex Co., Lowell, Mass., is now with Milner & Co., Moosup, Conn., filling a similar position.

—William Ennis, formerly boss weaver with the Dingley Mfg. Co., Philadelphia, Pa., is now with Edward T. Steel & Co., Bristol, Pa.

—James Grindrod, until recently boss weaver with the Old Kentucky Woolen Mills, Louisville, Ky., is now with the Evansville (Ind.) Woolen Mills as boss weaver and designer.

—William Grindrod has resigned as cloth examiner for the Old Kentucky Woolen Mills, Louisville, Ky., and accepted a similar position with the Brighton Mills, Philadelphia, Pa.

—M. J. Gahagan is now overseer of carding at the Oneko Mills, New Bedford, Mass. He was formerly in a similar position with the Otrobando Woolen Co., Norwich, Conn.

—James Hodgson is now with the Nye & Wait Carpet Co., Auburn, N. Y., as boss spinner.

—James H. Hendry, recently designer for the Globe Woolen Co., Utica, N. Y., has accepted a position as superintendent and designer at the Dalton Woolen Mills, Dalton, Mass.

—Samuel Haynes has resigned as assistant superintendent of the Waverly Woolen Co., Pittsfield, Me., and has been succeeded by Joseph Walker. Mr. Haynes has become superintendent of the Pioneer Woolen Mills in the same town, and Ernest Maxfield, formerly superintendent, is now connected with the new Riverside Woolen Co.

—George F. Hussey, boss dresser tender at the Hinsdale Woolen Mills, Hinsdale, Mass., has resigned and removed to Dalton, Mass.

—J. R. Milson, on October 1st, resigned his position as superintendent of the Cranston Worsted Mills, Bristol, R. I. He has purchased some machinery and intends starting in the business of manufacturing woolen yarns. He has several towns in view, but has not yet decided upon the location of his plant.

—James E. Milner is now with the Warren Woolen Co., Stafford Springs Conn., as boss finisher.

—William McArthur, of Ludlow, Vt., has taken charge of a section of looms in the Peck Woolen Mills, Pittsfield, Mass. His brother, John McArthur, has been boss carder at the mills for a number of years.

—A. F. Melrose, formerly overseer of dyeing with the J. L. & T. D. Peck Mfg. Co., Pittsfield, Mass., is now filling a similar position at the Devonshire Mills, Goffs Falls, N. H.

—George J. Oakes has recently returned to his old position as boss dresser with Edward T. Steele & Co., Bristol, Pa.

—John O'Connell, after seven years of service in the Beoli Mill, West Fitchburg, Mass., has severed his connection. He has accepted a position with the Glen Woolen Co., that city, as assistant foreman.

—Thomas Peat, formerly of Des Moines, Iowa, has accepted a position as boss spinner at the mill of the Hanover Woolen Mfg. Co., Hanover, Ill.

—J. H. Ridings has recently accepted a position as overseer of the finishing department for the Bemis Mills, Bemis, Mass.

—James Sutcliffe, for over 30 years overseer of the weaving department of the Talbot Mills, North Billerica, Mass., has retired from that position. Since he first took charge at the mills, many changes have occurred, there being then only about 50 looms and less than 40 employes. Now there are 180 looms. Mr. Sutcliffe's successor is Mr. Slocum of the Oneko Mills, New Bedford, Mass.

—James Sheridan has severed his connection with the Saranac Worsted Mills, Blackstone, Mass., and accepted a position as boss dyer in Woonsocket, R. I.

—Ernest Sutcliffe, formerly at the mill of the Cowan Woolen Co., Lewiston, Me., as foreman dyer, is now at New Bedford, in a similar capacity.

—Thomas Scully, formerly loom fixer in the Middlesex Mills, Lowell, Mass., has secured a position as boss weaver for the Glen Woolen Co., West Fitchburg, Mass.

—E. M. Southard has accepted a position as overseer of weaving with the Mayo Woolen Co., Millbury, Mass.

—Harry Weymouth, recently night overseer of carding for the Dews Woolen Co., North Dexter, is now at the Webster Woolen Co., Sabattus, Maine.

—John Weeks, second-hand of carding at the Dayville Woolen Co., Killingly, Conn., has been succeeded by David Hardy, Clayville, N. Y.

—David Welsh, formerly finisher for the National & Providence Worsted Mills, Providence, has accepted charge of the finishing room of the Wanskuck Mills, Providence.

—Philip Bertrand has returned from France and is now with the Heminway & Bartlett Silk Co., Watertown, Conn., as head dyer.

Deaths.

—Josiah B. Chase, for almost 30 years manager of the dry goods commission business of Porter Bros. & Co., 73 Lincoln St., Boston, died recently at his home in West Newton, Mass. He was born in Bristol, N. H., in 1834.

—Jesse M. Gould, boss carder with the Hope Valley (R. I.) Woolen Co., died suddenly at the mill recently, aged 56 years.

—John Haste, head finisher at the Perseverance Worsted Mill, Woonsocket, R. I., died last month, aged 42 years.

—The many friends of Mr. Will W. Dodge, treasurer of the Dodge Mfg. Co., were much shocked and grieved to hear of his death, which occurred in Mishawaka, Ind., September 1. Mr. Dodge was 30 years of age, and had been identified with the Dodge Mfg. Co. since its organization and was a large contributor to its success and prosperity.

—John P. Thompson, a well-known cotton mill manager and a noted inventor died at Providence, R. I., recently, aged 61 years. At the age of 26 he had charge of the carding department of the A. & W. Sprague Mill at Baltic, Conn., and then was superintendent of the Robeson Mills in Fall River and the Fall River Print Works and also started the new Shove Mill in that city. He later managed a mill in Phenix, Md., returning to Providence in five years to take charge of the Ross Mill in Olneyville. He was also at Mammoth Springs, Ark., and the Bluff City Mill at Memphis, Tenn. He invented 14 different mechanical devices for the improvement of cotton manufacture.

—J. Herbert Whittier died September 12th at the home of his parents in Deerfield, N. H. For seventeen years he was in the employ of the Cocheco Woolen Mfg. Co., at East Rochester, N. H., as bookkeeper. Mr. Whittier was foremost in the work for public libraries in New Hampshire.

—William Rice, a retired manufacturer, died recently at his home, 432 Lyceum Ave., Roxborough, Pa. He was born in Philadelphia, October, 16, 1824, and learned the trade of carder in Charles Sutton's Perseverance Mill in Manyunk. He later started in business for himself, manufacturing cotton and woolen yarns. In 1879 he formed a partnership with Lewis Bean, under the firm name of Rice & Bean and in a year's time they moved into their new mill at Shur's Lane, when Mr. Rice's son, Clayton G. Rice, who now operates the mill, was admitted to the firm, which was then known as Rice, Bean & Co. Messrs. Rice and Bean retired five years ago.

—John B. Williams, a well-known citizen of Baltimore, prominent in business and social life, died September 3d at his residence, 21 West Franklin St. Mr. Williams was born in Charleston, S. C., on Christmas Day, 1837. He was educated in Baltimore, to which place his family had moved, and early in life became associated with his father and brother in the cotton commission business, the firm being John Williams & Sons. In 1876 the firm was dissolved by the death of the senior partner and shortly thereafter Mr. Williams retired from the business.

—George N. Smith died September 9th, in Sutton, Mass., where he has lived quietly since he retired from business some years ago. He was 73 years old. He was born in Blackstone, Mass., and at the age of seven years began work in a woolen mill there, and since has been a manufacturer in his own name at Burrillville, R. I., Blackstone, Cherry Valley, Millbury, and Worcester, Mass.

—George W. Amory, a well-known cotton broker, died at the Massachusetts General Hospital, September 12th. He was for a number of years in Galveston, Texas, in business as a cotton buyer before the Civil War broke out, and after the war, returned South and started in the same business at Charleston, S. C. About twenty years ago he came back to Boston and has resided in this vicinity since.

—Frank H. Morehouse, of Newtonville, Mass., manager of the firm of Patterson Brothers, 568 Atlantic Ave., Boston, wool dealers, committed suicide by shooting at Young's Hotel, Sept. 23d. Sickness and overwork had brought about a disordered condition of the brain.

—Peter A. Lafloe, for a number of years overseer of carding in the No. 3 Harmony Mills, Cohoes, N. Y., died recently, aged 53 years.

—Joseph Fournier, while at work in the picker room of the Wampanoag Mill, No. 2, Fall River, Mass., dropped dead. His death was caused by heart failure.

—Frederick S. Page died at his home recently, aged 39 years. He was an overseer in the mill of the Willimantic Linen Co., Willimantic, Conn., having succeeded his father in that position.

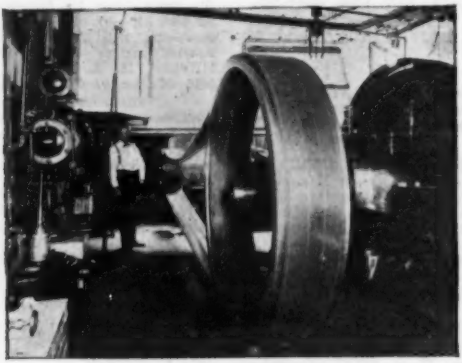
—Stephen W. Marston, senior member of the dry goods commission house of Minot, Hooper & Co., Boston, died at his home, 66 Beacon, St., in this city, Sunday, Sept. 3d.

—John A. Matthews, chief engineer at the Lewiston Bleachery & Dye Works, Lewiston, Me., died at the Central Main General Hospital, Sept. 14th, from injuries received by the bursting of a steam pipe at the works the day previous.

—George Allen died September 8th at his home on Dale Ave., Paterson, N. J., after an illness of about five weeks' duration. Mr. Allen came to this country about twenty years ago, locating in Paterson. He has held responsible positions in many of the largest local silk mills, just previous to his death being with the Avondale Silk Mill.

—The death of Frank S. McGovern, the 15-year-old son of James McGovern, of 1709 Blavis St., below Wayne Junction, Philadelphia, occurred in the afternoon of August 24th. He fell into a wool pit at McCallum & McCallum's carpet mills at Wayne Junction, his whole body being submerged in the wool.

—David Farmer died at his home in Manchester, N. H., recently, aged 51 years. He started to work for the Amoskeag Mfg. Co., in Manchester, as a bobbin boy, but rapidly advanced until he became overseer of the spinning in the old No. 4 mill. Owing to poor health, Mr. Farmer retired from mill business several years ago.



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Importers and Manufacturers.

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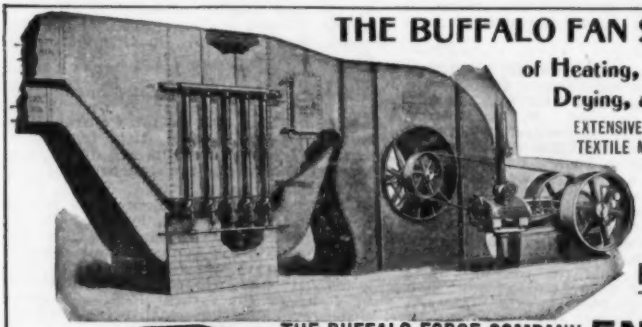

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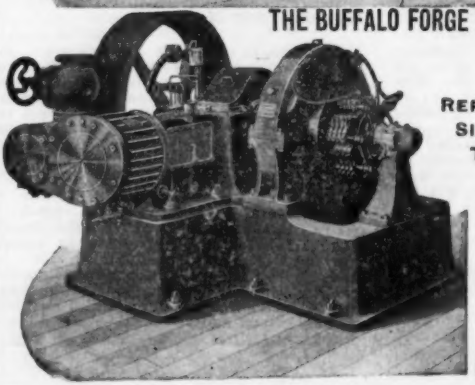

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BUYERS' INDEX.

Advertisers whose names do not appear under desired headings will please notify the publishers. Such omissions are accidental, not intentional.

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Architects and Mill Engineers.
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Tower & Wallace, Broadway and 25th St., New York, N. Y.

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Woonsocket Machine & Press Co, Woonsocket, R. I.

Balling Machine.
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Carpet Machinery.
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Howard, Geo. C., 1783 Barker St., Phila., Pa.

Chemicals and Apparatus.
Bullock & Crenshaw, 328 Arch (St, Phila, Pa.
Roessler & Hasslacher Chemical Co, 100 William St, New York.

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Adriance, John S., 105 East 39th St., New York.

Clutches.
The Eastern Machinery Co., New Haven, Conn.
James Hunter Machine Co., North Adams, Mass.
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Coal, (Anthracite and Bituminous.)
Whitney & Kemmerer, 143 Liberty St, N.Y.

Combs (Wool and Cotton).
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Dusenbury, C Coles, & Son, 396-398 Broadway, New York.
Hayes, O. H., 10 Thomas St., New York.

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Corrugated Iron Shutters.
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Howard & Bullough American Machine Co, Pawtucket, R. I.

Cutters for Knit Fabrics.

Kennedy, Thos. (Cutters, etc.,) Cohoes, N. Y

Decoration Wash for Interiors.

Moore, Benj. & Co., Brooklyn, N. Y.

Designer.

William Keiller, 28 Queen St., Belfast, Ire.

Dextrine.

Stein, Hirsh & Co, 165 Duane St., New York.

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Philadelphia Textile Machinery Co, Philadelphia, Pa.
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Sargent's, C. G., Sons, Graniteville, Mass.
Sturtevant, B. F. Co, 34 Oliver St, Boston, Mass.

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Dyers, Bleachers and Finishers.

American Yarn Printing Works, 134-150 North 22d St., Philadelphia.
Boston Finishing Works, Williamstown Mass.
Brophy's, T, Sons, Jasper St, Philadelphia.
Cohoes Dye Works, Cohoes, N. Y.
Cranston Worsted Mills (yarns), Bristol R. I.
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Littlewood, G. J., & Sons, Manayunk, Pa.
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Molt Bros., Millbury, Mass. (Indigo Blue.)
New England Thread Co, Pawtucket, R. I.
Novelty Dye Works, Cincinnati, Ohio.
Orianna Bleach Works, 2540 No. 3d St., Philadelphia.
Pawtucket Dyeing & Bleaching Co, Pawtucket R. I.
Rowland, Samuel, Schuylkill Haven, Pa.
Warren, W, Thread Works, Westfield, Mass.

Dyeing, Drying, Bleaching and Finishing Machinery.

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Buffalo Forge Co., Buffalo, N. Y.
Butterworth, H. W, & Sons Co, Phila, Pa.
Curtis & Marble Machine Co, Worcester, Mass.
Fairmount Machine Co, 22 and Wood Sts, Philadelphia.
Granger Foundry & Machine Co, Providence, R. I.
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Bailey, Frank, Cedar Brook, New Jersey.
Haedrich, E. M, 311 1-2 Walnut St, Phila, Pa.

Dyestuffs and Chemicals.

Amend Process Co., 205-211 Third Ave., New York.
American Aniline Co., 138 No. Front St., Philadelphia.
Anchor Color Mfg. Co, 464 Cherry St, New York.
Atteaux, F. E. & Co., 174-176 Purchase St Boston.
Berlin Aniline Works, 72 Front St., N. Y.
Bischoff, & Co, 87 Park Place, N. Y.
Bosson & Lane, 36 Central Wharf, Boston.
Corey, S. J, 273 Congress St, Boston.
Dillon & Co, 20 Cedar St, New York.
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Geisenheimer & Co, 189 Front St, New York.
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Merrimac Chemical Co, Boston, Mass.
Molt Bros. Millbury, Mass. (Indigo Blue.)
N. Y. & Boston Dyewood Co, 55 Beekman St, New York.
Oakes Mfg. Co, 93 Pearl St, N. Y.
Palmetto Co., The, 942 44 Drexel Building, Philadelphia.
Pickhardt & Kuttroff, New York.
Richmond & Foley, 235 N. Front St., Philadelphia.
Roessler & Hasslacher Chemical Co, 100 William St., New York.
Sharpless Dye Wood Ext. Co, 22 N. Front St, Phila, Pa.
Stamford Mfg. Co, 133 137 Front St., N. Y.
Stone & Ware Co, The, 157 Maiden Lane, N. Y.
Sykes & Street, 85 Water St, N. Y.

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Electrotyping and Printing.

Whitcomb, H. C, & Co, Boston.

Elevators.

Cohoes Foundry & Machine Co, Cohoes, N. Y.
Eastern Machinery Co, The, New Haven, Conn.
Howard, Geo. C., 1783 Barker St., Phila., Pa.

Engineers, Mechanical.

Berlin Iron Bridge Co., The, East Berlin, Conn.
Ferguson, John W, Paterson, N. J.

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Feed Water Heaters.

Kelley, Benj. F. & Son, 91 Liberty S New York.

Feed Water Pumps.

Goulds Mfg. Co, Seneca Falls, N. Y.
Phœnix Iron Foundry, Providence, R. I.

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Fireproof Construction.

The Berlin Iron Bridge Co., East Berlin, Conn.

Fluted Rolls.

Cohoes Foundry & Machine Co, Cohoes, N. Y
Thurston, A. G, & Son, Box 528, Fall River Mass.

Foundry Castings.

Plainfield Foundry Co., Plainfield, N. J.

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Fulling Mills for Woolen Goods.

Hopkins, Machine Works, Bridgeton, R. I.
Hunt, Rodney, Machine Co, Orange, Mass.
Hunter Jas, Machine Co, No. Adams, Mass.

Gas Engines.

Jones, Lewis, 60½ and Media Sts, Phila, Pa.

Gas Singeing Machines.

Biren Brothers, Somerville, Mass.
Butterworth, H. W. Sons Co., Philadelphia.
Curtis & Marble Machine Co, Worcester, Ms.
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Gear Cutting Machine.

Blaisdell, P, & Co, Worcester, Mass.
Whiton, The D. E. Co, New London, Conn.

Harness Varnish.

D. L. Witmer & Bro, 5th St. and Germantown Ave, Philadelphia.

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Heddles.

Watson, L. S, Mfg. Co, Leicester, Mass.

Hoisting Machinery.

The Eastern Machinery Co., New Haven, Conn.

Hosiery Boards.

Pearson, J. T, Kensington, Pa.

Humidifying Apparatus.

American Air Moistening Co., Boston.

Hydro Extractors.

American Tool & Machine Co , Boston.

Ink, Stamping.

Witmer, D. L, & Bro, 5th St. and Germantown Ave, Philadelphia.

Jacquard Card Boards.

Griffiths, Frank & Co , 2766 Ruth St., Phila.

Knit Goods Edgings, Trimmings, etc.

Cathcart, John & Co., 115 Franklin St., New York.
Cheney Bros, Silk Goods, 479 Broome St, N. Y.
Friedberger & Co, Edgings, Germantown Phila, Pa.
Hepner & Horwitz, Lacings, 30 Howard St, N. Y.
Krout & Fite Mfg. Co, Allegheny Ave. and Emerald St., Phila.
Weimar Bros, 1817 East York St, Phila. Pa.

Knit Goods Finishing Machines, Crochet, Etc.

Excelsior Sewing Machine Co, 120 N. 7th St, Phila, Pa.
Merrow Machine Co, The, Hartford, Conn.
Nye & Tredick, 606 Arch St, Phila, Pa.
Scott & Williams, 2079 E. Cumberland St, Phila Pa.

Knitting Machine Cylinders.

Paxton & O'Neill, 129 Bread St, Phila, Pa.
Stafford & Holt, Little Falls, N. Y.

Knitting Machinery.

Beattie Machine Works, Cohoes, N. Y.
Branson Machine Co., 506 John St., Philadelphia.
Campbell & Clute, Cohoes, N. Y.
Cooper, Chas, Bennington, Vt.
Crane Mfg. Co, Lakeport, N. H.
Excelsior Knitting Machine Manufacturing Co., Allentown, Pa.
Hepworth & Co, Lehigh Ave. and Mascher St, Phila, Pa.
Jenckes, E. Mfg. Co, Pawtucket, R. I.
Jones, Lewis, 60 1-2 and Media Sts, Philadelphia, Pa.
Kennedy, Thos. (Cutters, etc.), Cohoes, N. Y.
Leighton Machine Co, Manchester, N. H.
Mayo Knitting Machine & Needle Co, Franklin, N. H.
McMichael & Wildman Mfg. Co, Norristown, Pa.
Mueller, A, 760 Lexington Ave, Brooklyn, N. Y.
Nye & Tredick, 606 Arch St, Phila, Pa.
Paxton & O'Neill, 127 Bread St, Phila, Pa.
Pepper Mfg. Co, Lakeport, N. H.
Scott & Williams, 2079 E. Cumberland St., Phila., Pa.
Stafford & Holt, Little Falls, N. Y.

Knitting Needles and Supplies.

Breedon, Wm, & Son, Amsterdam, N. Y.
Cooper, Chas, Bennington, Vt.
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Crane Mfg. Co , Lakeport, N. H.
Dodge Needle Co., Manchester, N. H.
Ives, Loyal T, New Brunswick, N. J.
Lydall, H, & Fonlds, Manchester, Conn.
Manufacturers' Supplies Co., 66 No. 4th St., Philadelphia.
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Treat, Orion, Manchester Green, Conn.
Wardwell Needle Co, Lakeport, N. H.

Laboratory Outfits.

Bullock & Crenshaw, 528 Arch St Phila, Pa.

Lapping Machine Attachment.

W. J. Hurley, Kimesville, N. C.

Looms.

Draper Company, Hopedale, Mass.
Fairmount Machine Works, 22d and Wood Sts. Philadelphia.
Furbush, M. A, & Son Co, Phila, Pa.
Howard, Geo. C., 1738 Barker St, Phila, Pa. (For wire.)
Kilburn, Lincoln & Co, Fall River, Mass.
Leigh, Evan A., 35 Mason Bldg., Boston.
Lowell Machine Shop, Lowell, Mass.
Mason Machine Works, Taunton, Mass.
Whitin Machine Works, Whitinsville, Ms,
Woonsocket Machine & Press Co, Woonsocket, R. I.

Lubricators

Ameledema Oilless Bearing Co., Berkeley St , Wayne Junction, Philadelphia.
Dixon, Jos., Crucible Co, Jersey City, N. J.
Graphite Lubricating Co., Bound Brook, N. J.

Lumber.

Stearns, A. T, Lumber Co, Neponset, Mass.

Lumpers.

Gerry, George, & Son, Athol, Mass.

Machinery Dealers.

Jefferson, Ed, & Bro, 28 Strawberry St, Phila, Pa.

Machinists' Tools.

Blaisdell, P, & Co, Worcester, Mass.
Whiton, The D. E. Co, New London, Conn.

Mails.

Walder, J. Paterson, N. J.

Measuring and Folding Machines.

Curtis & Marble Machine Co, Worcester, Ms.
Elliott & Hall, 544 Hermon St, Worcester Mass

Mercerizing Machinery.

Butterworth, H. W. & Sons, Philadelphia.
Granger Foundry & Machine Co., Providence R. I.

Mills For Sale.

Denny, R. B., 143 Federal St., Boston.

Mill Builders and Engineers.

Berlin Iron Bridge Co. The, East Berlin, Ct
Ferguson, John W, Paterson, N. J.

Mill Supplies.

American Supply Co, Providence, R. I.
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Bristol, The, Co., Waterbury, Conn
Buckley's, Benj. Son, Gun Mill, Paterson, N. J.

Dixon Lubricating Saddle Co., Bristol, R. I.
Easton-Burnham Co., Pawtucket, R. I.
Frost, Geo. T., Paterson, N. J.
Jefferson, Ed, & Bro, 28 Strawberry St, Phila, Pa.
Mitchell-Bissell Co., 170 Summer St., Boston.
Thurston, A. G, & Son, Fall River, Mass.
Watson, L. S, Mfg.Co, Leicester, Mass.

Napping Machines.
American Napping Machine Co, Williamstown, Mass
Ardrey, S. B, & Sons, Bristol, Pa.
Curtis & Marble Machine Co, Worcester, Mass.
Jones, Lewis, 60 1-2 and Media Sts., Philadelphia, Pa.

Noils (Silk.)
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Pantagraphs for Mill Engraving.
Johnson, C. A, & Co, 22 Dey St, New York.

Patterns of European Novelties.
European Pattern Supply Co., 530 Broadway, N. Y.
European Textile Sample Co., 56 Worth St., New York.

Patent Solicitors.
Crosby & Gregory, 24 School St, Boston, Mass.
Siggers, E. G., Washington. D. C.
Wright, Brown & Quinby, 53 State St, Boston, Mass.

Perforated Metal.
Beckley, A. J. & Co., Garwood, N. J.
Harrington & King Perforating Co., 230 North Union St , Chicago. Ill.

Peroxide of Sodium.
Roessler & Hasslacher Chemical Co., 100 William St, New York.

Picker Sticks.
La Bar, L. T., Beateyestown, N J.
Loom Picker Co., Biddeford, Me.

Picking, Carbonizing and Garnetting.
Garfield Woolen Co, Garfield, N. J.

Pipe Covering (Magnesia).
Keasby, R. A. 83 Warren St, New York.

Pneumatic Conveying.
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Porcelain Guides.
Mitchell-Bissell Co., 170 Summer St., Boston.

Power Transmitting Machinery.
Ameledema Oilless Bearing Co, 149 West Berkley St, Wayne Junction, Pa.
Channon, H, Co, 25 Market St, Chicago, Ill.
Christiana Machine Co., Christiana, Pa.
Eastern Machinery Co, New Haven, Conn.
Fairmount Machine Works, 22d and Wood Sts, Philadelphia.
Howard, Geo. C., 1783 Barker St., Phila., Pa.
Hunter, Jas, Machine Co, No. Adams, Mass.
Kilburn, Lincoln & Co Fall River, Mass.
Link Belt Machinery Co, Chicago, Ill.
Saginaw Manufacturing Co., Saginaw, Mich.
Wall, William F. Rope Company, 56 South St., New York.

Presses.
Boomer & Boschet Press Co., 338 West Water St., Syracuse, N. Y.
Butterworth, H. W. & Sons Co., Philadelphia
Crawford. J. J, & Son, Nashua, N. H. (Power Screw, Hydraulic, Hollow Steam Plate.)
Curtis & Marble Machine Co, Worcester, Ms.
Hart, Charles, Frankford, Philadelphia.
Howard, Geo. C., 1783 Barker St., Phila., Pa.
Phillips Co, The Thomas, Providence, R. I.
Sullivan Machinery Co., Claremont, N H.
Woonsocket Machine & Press Co, Woonsocket, R. I.

Pressing Irons, Gas and Air Heated.
Edwards Sad Iron Co , 1420 Chestnut St., Philadelphia.

Printers and Embossers.
Novelty Textile Printing Co, 447-449 W. 14th St, New York.

Pulleys.
See Power Transmitting Machinery.

Pumps.
Goulds Mfg. Co, Seneca Falls, N. Y.

Quills.
Parker, Henry, Co., Springfield, Vt.

Reed and Harness Manufacturers.
American Supply Co, Providence, R. I.
Walder, J, Paterson, N. J.

Ribbons.
Cheney Bros, S. Manchester, Ct.

Roofing, Gravel, Slag and Composition.
Armitage Mfg. Co, Richmond, Va.
Eastern Granite Roofing Co., Jersey City N. J.

Roofing, Paint and Paper.
Armitage Mfg. Co, Richmond, Va.

Roving Cans and Sheet Metal Work for Mills.
N. E. Ventilating & Heating Co, 930 Manton Ave. Providence, R. I.
Sullivan Machinery Co, Claremont, N. H.
Walrus Fibre Mfg. Co., Medford, Mass.

Saddles and Stirrups.
Dixon Lubricating Saddle Co., Bristol, R. I.

Schools.
American Correspondence School of Textile, New Bedford, Mass.
Lowell Textile School, Lowell, Mass.
New Bedford Textile School, New Bedford, Mass.
Philadelphia Textile School, Phila, Pa.

Screens (Perforated.)
See under Perforated Metal.

Sewing Machines and Supplies.
Birch Bros., Somerville, Mass.
Curtis & Marble Machine Co, Worcester, Mass.
Frame, Gibbons, 2nd and Diamond Sts, Phila, Pa.
Manufacturers' Supplies Co., 66 No. 4th St., Philadelphia.
Nye & Tredick, 606 Arch St, Phila, Pa.
Standard Sewing Machine Co, Cleveland, Ohio.
Scott & Williams, 6th and Arch Sts, Phila, Pa.
Union Button Sewing Machine Co., 164 High St., Boston, Mass.

Shearing Machinery.
See Dyeing, Drying, Bleaching and Finishing.

Shell Rolls.
Cohoes Foundry & Mach. Co, Cohoes, N. Y.
Thurston, A. G, & Son, Box 528, Fall River, Mass.

Shoddies.
See Wool Shoddies.

Shuttles.
See Bobbins, Spools, Shuttles, Etc.

Shuttle Eyes.
Mitchell-Bissell Co., 170 Summer Street, Boston

Silk (Tussah.)
Cornelis, Chailly & Co., 339 East 107 St , New York.

Silk Machinery.
Butterworth, H. W. Sons Co, Philadelphia.
Granger Foundry & Machine Co., Providence, R. I.
Mason Machine Works, Taunton, Mass.

Singe Plates.
Butterworth, H. W. Sons Co., Philadelphia.
New Bedford Copper Co, New Bedford, Mass

Sizing, Starch and Gums.
Quaker City Chemical Co., Wayne Junction, Philadelphia
Stein, Hirsch & Co, 165 Duane St, New York.

Slashers.
Cohoes Foundry & Machine Co, Cohoes, N. Y.
Lowell Machine Shop, Lowell, Mass.
Phillips C The Thomas, Providence, R. I.

Soaps.
Holbrook Manufacturing Co., New York.
India Alkali Works, Boston, Mass.

Spindles.
Bamford & Smith, Pascoag, R. I.
Buckley, Benj's, Sons, Gun Mill, Paterson, N. J.
Draper Company, Hopedale, Mass.
Easton-Burnham Co., Pawtucket, R. I.
Ward & Vandegrift, Elmer, N. J.
Whitin Machine Wks, Whitinsville, Mass.

Spindle Hook Bands.
Geo. T. Frost, Paterson, N. J.

Spindle Tubes.
Bamford & Smith, Pascoag, R. I.

Spinning Cylinders.
N. E. Ventilating & Heating Co, 930 Manton Ave, Providence, R. I.

Spinning Frames.
See Cotton Machinery.

Spinning Frames for Wool
Woonsocket Machine and Press Co., Woonsocket, R. I.

Spinning Rings.
Draper Company, Hopedale, Mass
Morley Button Mfg. Co., Boston, Mass.
Whitinsville Spinning Ring Co, Whitinsville, Mass.

Spinning Tubes.
Buckley, Benj's. Son, Gun Mill, Paterson, N. J.

Spools. *See Bobbins, Spools Shuttles, Etc.*

Steam Boilers.
Brown, C. H, & Co, Fitchburg, Mass.
Lee-Odlum Co., Memphis, Tenn.

Steam Boiler Compound.
Straus & Co., 55 Broad St., New York.

Steam Boiler Insurance.
Hartford Steam Boiler Inspection & Insurance Co, Hartford, Conn.

Steam Engines.
Brown, C. H, & Co, Fitchburg, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Hooven (The), Owens & Rentschler Co, Hamilton, O.
Sturtevant, B. F. & Co., Boston.

Steam Specialties.
Butterworth, H. W. Sons Co., Philadelphia.

Tanks, Tubs and Vats.
Caldwell Co., W. E. 202 Brook St., Louisville, Ky.
Corcoran, A. J, 11 John St, New York.
Cypress Lumber Co, Apalachicola, Fla.
Lee-Odlum Co., Memphis, Tenn.
Stearns, A. T, Lumber Co, Neponset, Mass.
Vaughn Machine Co., Peabody, Mass.
Woolford, George, 2240 No. 9th St, Phila, Pa.

Tapes, Braids and Edgings.
Cathcart, John, & Co, 115 Franklin St, N. Y.
Fleming & Chapin, 229 Church St., Phila.
Friedberger Mfg. Co, Germantown, Pa.
Hamilton, J. H , & Co, 275 Church St, N. Y.
Krout & Fite Mfg. Co., Allegheny Ave. and Emerald St., Philadelphia.
Weimar Bros, 1817 East York St, Phila, Pa.
Young, Wm. M, 3638-40 Frankford Ave, Philadelphia, Pa.

Telephones.
F O. Plummer, 620 Atlantic Ave., Boston.

Tentering Machines.
See Dyeing, Bleaching Machinery, Etc.

Tension Pulleys.
N. E. Ventilating & Heating Co, 930 Manton Ave, Providence, R. I.

Testing Machines.
Howard, Geo. C., 1783 Barker St., Phila., Pa

Towers.
Caldwell Co., W. E. 202 Brook St., Louisville, Ky.
Lee-Odlum Co., Memphis, Tenn.

Traveler's Cheques.
American Express Company.

Trucks.
Armstrong Truck Co., Philadelphia.

Turbines.
(See Water Wheels.

Ventilating Apparatus.
Allington & Curtis Mfg. Co , Saginaw, Mich., and East Cambridge, Mass.
American Air Moistening Co., Boston.
Berger Bros. Co., 231-237 Arch St., Philadelphia.
Berry, A. Hun, 23 W. 1st St, Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
New England Ventilating & Heating Co, Providence, R. I.
Philadelphia Drying Machinery Co., 6721 Germantown Ave., Philapelphia.
Philadelphia Textile Machinery Co, Hancock St, above Lehigh Ave, Phila, Pa.
Sargent's, C. G., Sons, Graniteville, Mass.
Sturtevant, B. F. Co, 34 Oliver St, Boston, Mass.

Washers (Cloth).
Birch Brothers, Somerville, Mass.
Butterworth, H. W. & Sons Co., Philadelphia.
Hopkins, Machine Works, Bridgeton, R. I.
Hunt, Rodney, Machine Co, Orange, Mass.
Hunter, Jas, Machine Co, No. Adams, Mass.
Phillips Co, The Thomas, Providence, R. I.

Waste Unraveller.
Whiteford, R. A. P Philadelphia.

Watchman's Clock.
Eco Magneto Clock Co, 620 Atlantic Ave, Boston.
Nanz & Co, 127 Duane St., New York.

Water Wheels.
Bradway, C. P., W. Stafford, Ct.
Christiana Machine Co., Christiana, Pa.
Hunt, Rodney, Machine Co, Orange, Mass.
Leffel, James, & Co, Springfield, O.

Water Wheel Governors.
Bradway, C. P, West Stafford, Ct.
Cohoes Foundry & Machine Co, Cohoes N. Y.
Leffel, James & Co, Springfield, Ohio.
Lombard Water Wheel Governor Co, 61 Hampshire St, Boston.

Winders. (Hosiery.)
Universal Winding Co, 226 Devonshire St, Boston.

Wood Pulleys.
Saginaw Manufacturing Co, Saginaw, Mich.

Wool Cleaning Compound.
India Alkali Works, Boston.

Wool Combing Machinery.
Leigh, Evan A. 35 Mason Bldg., Boston.

Wool Extracts.
Garfield Woolen Co, Garfield, N. J.

Wool and Waste Dusters.
Gerry, Geo, & Son, Athol, Mass.
Sargents', C. G., Sons, Graniteville, Mass.
Stillman-Randall Machine Co, Westerly, R. I.

Woolen and Worsted Machinery.
Altemus, W. W, & Co, 2816 N. 4th St, Phila Pa.
American Tool and Machine Co., Boston.
Birch Brothers, Somerville, Mass.
Butterworth, H. W. Sons Co., Philadelphia.
Cobb, Thad. S., Machinery Co., Lowell, Mass.
Curtis & Marble Machine Co, Worcester, Mass.
Fairmount Machine Works, 22d and Wood Sts, Philadelphia.
Furbush, M. A. & Son Machine Co, Phila, Pa.
Howard, Geo. C., 1783 Barker St., Phila., Pa.
Hunt, Rodney, Machine Co, Orange, Mass.
Hunter, Jas, Machine Co, No. Adams, Mass.
Jefferson, Ed, & Bro, 28 Strawberry St, Phila, Pa.
Kenyon D. R. & Son, Raritan, N. J.
Leigh, Evan A. 35 Mason Bldg, Boston.
Philadelphia Drying Machinery Co., 6721 Germantown Ave., Philadelphia.
Philadelphia Textile Machinery Co., Hancock and Somerset Sts., Philadelphia.
Phillips Co. The Thomas, Providence, R. I.
Sargent's, C. G., Sons, Graniteville, Mass.
Stoddard, Haserick, Richards & Co, Boston, Mass.
Woonsocket Machine & Press Co Woonsocket, R. I.

Wool, Hair and Noils.

Becker, Chas. W, Agt, Amsterdam, N. Y.
Fowles & Co, 106 Church St, Phila.

Wool Shoddies.

Becker, Chas. W, Agt, Amsterdam, N. Y
Garfield Woolen Co, Garfield, N. J.
Slack, Wm. H. B., & Bro, Springfield, Vt.

Wool Sorters, Scourers and Carbonizers.

Morse Wool Treating Co., Norton, Mass.

Wool Washing, Preparing and Drying Machinery.

Philadelphia Drying Machinery Co., 6721 Germantown Ave., Philadelphia.

Phillips Co, The Thomas, Providence, R. I.
Sargent's, C. G, Sons, Graniteville, Mass.

Woolen Commission Merchants.

Dusenberry, C. Coles, 396 Broadway, New York.

Hayes, O. H. & Co., New York.

Yarns, Threads, Etc.

Banding.

Frost, Geo. T, Paterson, N. J.
Moore, C. & Co, 12 S. 5th St, Phila, Pa.
Warren, W, Thread Works, Westfield, Mass.
Solis, Andrew J, Jr, & Co, 179 Devonshire St, Boston, Mass.
Tucker & Cook Mfg. Co, Conway, Mass.
Whittier Cotton Mills, Lowell, Mass.

Cotton Yarns.

American Cotton Yarn Exchange, 45 Milk St., Boston.
Catlin & Co, New York and Boston.
Clark, Wm, Co, Westerly, R. I.
Cohannet Mills, Taunton, Mass.
Crossland, Enos, Sons, Philadelphia, Pa.
Eddy & Street, Providence, R. I.
Eichmann & Sternberg, 530 Broadway, cor Spring St., N. Y.
Fleming & Chapin, Philadelphia.
Germantown Spinning Co, Germantown, Pa.
Grant Yarn Co, Fitchburg, Mass.
Greene & Daniels Mfg. Co, Pawtucket, R. I.
Hadley Co, Holyoke, Mass.
Indian Orchard Co., Indian Orchard, Mass.
Jenckes, E., Mfg. Co., Pawtucket, R. I.
Mitchell, Jas. E, & Co, Boston and Phila, Pa.
Montgomery, J. R, Co, Windsor Locks, Ct.
Monument Mills, Housatonic, Mass.
New England Thread Co., Pawtucket, R. I.
Orswell Mills, Fitchburg, Mass
Tucker & Cook Mfg. Co, Conway, Mass.
Whittier Cotton Mills, Lowell, Mass.

Gassed Yarns.

Greene & Daniels Mfg. Co, Pawtucket, R. I.

Glazed Yarns.

Eichmann & Sternberg, 530 Broadway, cor Spring St., N. Y.
Indian Orchard Co., Indian Orchard, Mass.
Lorimers, Wm. H. & Sons Co., Philadelphia.
Malcolm Mills Co, Frankford, Pa.
Meyer, John C. & Co., 87 Summer St., Boston.
Montgomery & Co, J. R, Windsor Locks, Ct.
New England Thread Co., Pawtucket, R. I.
Warren, W, Thread Works, Westfield, Mass.
Whittier Cotton Mills, Lowell, Mass.

Harness Twines.

Cranston Worsted Mills, Bristol, R. I.
Fawcett, Hughes, 115 Franklin St., N. Y.
Hadley Co, 95 Milk St, Boston, Mass.
Moore, C., & Co., (S. W. cor. 5th and Market Sts.)
Warren, W, Thread Works, Westfield, Mass
Whittier Cotton Mills, Lowell, Mass.

Hosiery and Knitting Yarns.

Boyer, B. F, & Co, Camden, N. J.
Campbell, Geo. & Co, Phila, Pa.
Champlain Silk Mills, Whitehall, N. Y.
Clark, Wm, Co, Westerly, R. I.
Clasgens, The J. & H. Co, New Richmond, Ohio.
Cohannet Mills, Taunton, Mass.
Colchester Mills, 36-38 Franklin St, New York.
Cranston Worsted Mills, Bristol, R. I.
Eichmann & Sternberg, 530 Broadway, cor. Spring St., N. Y.
Germantown Spinning Co, Germantown, Pa.
Greene & Daniels Mfg. Co, Pawtucket, R. I.
Hyde, E. S, 223 Chestnut St, Phila, Pa.
Jenckes, E., Manufacturing Co, Pawtucket, R. I.
Mitchell, James E, & Co, Phila. and Boston
Monument Mills, Housatonic, Mass.
Orswell Mills, Fitchburg, Mass.
Skerry, A. T, & Co, 47 Leonard St, N. Y.
Walcott & Campbell Spinning Co, New York Mills, Oneida Co, N. Y.
Warren, W, Thread Works, Westfield, Mass.
Whittier Cotton Mills, Lowell, Mass.

Flax, Hemp, Jute and Ramie.

Eichman & Sternberg, 530 Broadway, cor. Spring St., N. Y.
Fawcett, Hughes, 115 Franklin St., N. Y

Mohair Yarns.

Cranston Worsted Mills, Bristol, R. I.
Eichmann & Sternberg, 530 Broadway, cor Spring St., N. Y.
Skerry, A. T, & Co, 47 Leonard St, N. Y.

Novelty Yarns, Tinsels, Silk Noils, Etc.

Champlain Silk Mills, Whitehall, N. Y.
Cranston Worsted Mills, Bristol, R. I
Eichmann & Sternberg, New York City.
Indian Orchard Co., Indian Orchard, Mass.
Malcolm Mills Co, 229 Chestnut St, Phila, Pa.
Montgomery & Co, J. R, Windsor Locks, Ct.
Skerry, A. T, & Co, 47 Leonard St, N. Y.

Silk Yarns.

Champlain Silk Mills, Whitehall, N. Y.
Cheney Bros, S. Manchester and Hartford Ct.
Eddy & Street, Providence, R. I.
Eichmann & Sternberg, 530 Broadway, cor. Spring St., N. Y.
Meyer, John C, & Co., 87 Summer St., Boston.
Ryle, Wm, & Co, 54 Howard St, N. Y.

Woolen and Merino Yarns.

Boyer, B. F, & Co, Camden, N. J.
Clasgens, The J. & H. Co, New Richmond Ohio.
Crossland's Enos. Sons, Philadelphia.
Eddy & Street, Providence, R. I.
Hyde, E. S, 223 Chestnut St, Phila, Pa.
Jenckes, E. Mfg. Co., Pawtucket, R. I.
Skerry, A. T, & Co, 47 Leonard St, N. Y.
Solis, Andrew J, Jr, & Co, 179 Devonshire St, Boston, Mass.

Worsted Yarns.

Alleghany Worsted Mills, Phila, Pa.
Boyer, B. F, & Co, Camden, N. J.
Campbell, Geo. & Co, Phila, Pa
Campion, Richard, 17 Bank St., Philadelphia.
Cranston Worsted Mills, Bristol, R. I.
Croft, Howland, & Sons, cor. Broadway and Jefferson Ave., Camden, N. J.
Eichmann & Sternberg, 530 Broadway, cor. Spring St., N. Y.
Elsasser, Albert R, Addingham, Pa.
Goff, D. & Sons, Pawtucket, R. I.
Herbst & Jones, 21st and Naudain Sts Philadelphia, Pa.
Pocasset Worsted Co., Thornton, R. I.
Skerry, A. T, & Co, 47 Leonard St, N. Y.
Solis, Andrew J, Jr, & Co, 179 Devonshire St, Boston, Mass.
Waverly Worsted Co, Main St. and Green Lane, Manayunk, Pa.

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1575 **Assistant Supt. Woolen.** A graduate of the Philadelphia Textile School (highest standing), and has had more than 7 years' experience in the various departments of a Massachusetts mill. Wants to get a start where there is fair chance of advancement. Age 28, single.

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218 **Woolen Superintendent, Designer** or Boss Weaver. Age 35; American. Has worked on all classes of dress goods and men's wear. Can furnish good references, and will accept a moderate salary.

1386 **Woolen Superintendent or** Boss Carder. Age 43; American. Familiar with the manufacture of all kinds of woolen goods, is well recommended, and can go immediately.

1490 **Superintendent** Age 37; German. Has worked on plain and fancy worsteds, cotton worsted, all woolen mixes and mixed cassimeres. 14 years' experience in this country.

COTTON SUPERINTENDENTS.

189 **Cotton Superintendent** wants position in Northern mill. Has been in charge of Southern mills for 7 years. Previous experience in N. E. Is well known among mill men, and can furnish the best of references. Age 36; married.

1390 **Cotton Superintendent.** Especially qualified for a mill making dress goods and fine shirtings. Experience with first-class mills as designer and manager. A young man of high character. At present employed.

1532 **Superintendent.** Has been in mill business all his life, and been with the present firm for a number of years, having been promoted several times. He wishes to better himself.

1306 Young American wants position as cotton superintendent. Experience mostly on cotton warps. Has been bookkeeper, overseer of carding and spinning; also superintendent in Massachusetts mills.

1486 **Superintendent** or will take a position as boss spinner in a large room. Age 43; American. Experienced mostly on plain goods. At present employed as overseer.

1464 **Superintendent of Fancy Cotton** Weaving. Age 43; married; an American. Will not work outside Northern and Eastern states. Has worked on fancy goods of all kinds, white and colored cottons, worsteds and silks. Is familiar with all makes of looms and dobby heads. Is at present employed, but wishes to better himself, if possible. Refers to present and past employers.

1453 **Superintendent** desires position in a cotton mill Age 26; married; American. Has worked on prints, fine sateens, sheeting ginghams, duck, denims, cottonades, ticks, awnings and domets. Is familiar with all makes of spinning, spooling and warping machinery. At present employed, but wishes to obtain a more advanced position. Refers to present and past employers.

1269 **Cotton** superintendent, carder, spinner and dresser; 43; married. Has held position in some of the best mills; is strictly temperate, and well recommended. Cotton, flannels, ginghams, crochet and Marseilles quilts, etc.

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1578 **Wool or Worsted Carder.** 20 years' experience as overseer, with excellent references. Understands almost all kinds of machines. Would also consider position as traveling agent for mill supplies, as he has a large acquaintance with mill men.

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1582 **Woolen Carder or Second-Hand.** Large experience in Massachusetts mills. Age 28, single. American. Good references. Is at present out of work and will start at moderate wages.

1475 **Wool Carder and Spinner.** Out of work because his mill shut down. An excellent carder and spinner, highly recommended. Prefers the West. Will start at moderate salary.

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1564 **Boss Woolen Carder,** experience on all kinds American cards and Platt cards. Refers to several good mills where he has worked from 3 to 6 years. Very steady and hard worker. Age 42, not married.

1565 **Wool Carder,** has worked 9 years as second hand under some of the best carders in N. E. Experience on nearly all kinds of stock. Temperate and a hustler. Age 30, single. Would take a good second hand job.

COTTON CARDERS.

1403 **Cotton Carder** with 17 years experience in N. E. mills as overseer and second hand, now in the South but wants to return North. Has never worked for less than $3.00 but would take $2 50 to change. Married. Age 38. Best of references.

1469 **Cotton Carder and Spinner.** Has had charge of both in good mills. Excellent references. Age 37, married.

1535 **Second-Hand Carding, or Speeder Fixer.** Age 41; American. Is a first class man, and thoroughly acquainted with every detail of his work. At present employed, but can leave on very short notice. Prefers to obtain work in New England States.

1315 **Cotton Carder.** Over 20 years' experience as overseer in first class mills. At present employed. Well up on prints and light and heavy sheetings. Knows American and English cards, and speeders. Best references.

1238 **Second** hand of cotton carding. 37; married. Open for engagement.

1368 **Overseer on Second-Hand Cotton** Carding wants a position in small room at $2.50 per day or upwards. Will do his own grinding. Or, would take a first-class second hand job. Last five years in one place. Thoroughly practical and understands all the machinery in the card room. Age 37; married. Good reference. Prefers New England.

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1461 **Spinner, on Cotton or Wool.** Age 25; married; French. Has worked in one of the best thread works in this country, also in Alsace-Lorraine, on yarns from 70s to 160s. Is familiar with Dobson & Barlow machines and Schlumberger mules.

1493 **Boss Spinner.** Age 25; unmarried; German. Has worked on cassimeres, cheviots, stockinets, satinets and camel hair goods. Can operate American mules, and has worked for several years in American mills, to which he refers.

847 **Boss Woolen Spinner** with large experience and excellent references. Will start at $2.50 a day. Has spun yarns for fine dress goods, and yarns for low grade wool and cotton and shoddy mixes, and all cotton for hosiery. Perfectly reliable and temperate.

1543 **Woolen Spinner and Carder.** Has handled both departments together and separately. Will go South or West. Age 29; single.

1545 **Woolen Spinner.** A very reliable man, who has worked up to 2nd hand in a good N. E. mill, wishes to secure a position as overseer.

1519 **Overseer Spinning.** Age 31; American; married. Has worked on yarns from one run to 5⅝. Will accept an average salary. At present employed, but wishes to better himself.

COTTON SPINNERS.

909 **Overseer Cotton Spinning,** spooling, warping, twisting, slashing and drawing-in. 16 years experience, mostly in this department. At present out of work because of change in organization. Can refer to leading N. E. mills. Will go South. Age 30; married.

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1517 **Overseer Woolen Weaving.** Age 37; married. Has had a large experience on all classes of woolens and worsteds. Will go anywhere

1521 **Overseer Weaving,** on woolen or cotton goods. Age 42; American; married. Has worked on all classes of cotton, woolen, worsted and silk goods. Refers to past employers and others.

1585 **Woolen Weaver.** Has had large experience as fixer and weaver on Davis & Furber looms. A man of good habits and character. Now employed in a Massachussets mill. Good references. Also familiar with Crompton & Knowles and Gilbert looms

1452 **Boss Weaver, Superintendent,** or Designer. American; age 43; married. Has had 20 years experience on men's wear and ladies' woolen dress goods. Good recommendations from present and former employers. Good manager of help. Wishes to obtain a position where he will receive $4 and upwards per day.

1581 **Boss Weaver on Woolens** wants position in charge of a room on plain goods. Has worked on both plain and fancy work. At present employed. Can furnish excellent references from past jobs. Experience on Crompton & Knowles fancy, Gilbert and Davis & Furber plain looms. Age 40, married.

1547 **Boss Weaver,** with very long and varied experience. Familiar with all makes of machinery. Has been superintendent but would accept overseer job in a first class mill.

1551 **Boss Weaver,** especially up on plush looms, both wire and double. Has worked in almost every department of woolen mill and would take charge of a small plant at moderate salary. Age 42; married. New England experience.

COTTON WEAVERS.

1556 **Cotton Weaver.** Learned fixing in England and has been 16 years in Canada, 8 years overseer of weaving, beaming and warping. Wants to work in the U. S. will accept $3.00. Age 33; married.

1573 **A1 Cotton Weaver** on drills, prints, sheetings and fine goods. Now employed but wants to change for larger room. Has had charge of medium size mill, and would take position as superintendent. First class in every respect, large experience, best of references.

1533 **Overseer Weaving or Superintendent.** American; age 38; married. Has had twelve years experience on all grades of white and colored fancy goods. Would like overseers' position in large weaving room, or on carding.

1572 **Overseer of Cotton Weaving,** now employed in first class mill as second-hand, but would like to have charge of a room at $3 a day. Experience covers sheetings, sateens, drills, flannels, denims and stripes of all kinds. Lowell and Whitin looms. American; age 32, married. Excellent references from present and past employers.

1563 **Overseer Cotton Weaver** who has long experience as fixer, second hand and overseer on all kinds of cotton and silk looms. Splendid references from past employers. At present employed. Age 40; married.

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1544 **Underwear Knitter.** 10 years' experience on ribbed underwear. Has run silk, worsted, lisle, cotton and mixed yarn. Best references from present employer, with whom has worked four years Can leave at once.

1492 **Boss Knitter,** Spring needles. Now holding a position in N w York. A No. 1 on fleeces, both single, double, and cut pressers. Understands running and setting in all gauges from 12 to 32. Working at present on 26 and 30. Understands all makes of latch needles for underwear.

1554 **Boss Knitter.** Underwear, Jersey ribbed, lisle, wool, plaited work, silk Can handle any latch machine. Good references. Age 26; married.

1435 **Boss Knitter.** Underwear, astrakhans, stockinet, rubber linings, etc. Efficient workman on circular spring needle machine. Age 36. Married.

1401 **Boss Knitter** at present employed but wants to change. Experience on plush, cotton, and wool. 10 years as second hand previous to present position as overseer. Age 30. Married.

1568 **Underwear Knitter.** A young man with thorough training, and 7 year's experience as second-hand in N. Y. mill, wants position as boss knitter. Ribbed, fleece lined, cotton and woolen underwear. Campbell & Clute, Tompkins & Circular Rib Machine. American. References, first-class.

1371 **Cotton Hosiery Supt.** Has had charge of hosiery mill in N. C. Would like a western mill. Refers to last position. Young man, not married.

1450 **Foreman or Superintendent of Hosiery.** Age 40; married. Has worked on cut feet, seamless half hose, ladies' and children's hosiery. Is familiar with every standard make of knitting and sewing machines. Is first-class finisher, and can start new plant. Salary moderate. Prefers to go South, if possible. Refers to former and present employers.

DYERS.

1531 **Boss Dyer.** American; Age 32 unmarried. Has had a large experience on raw stocks, rags, worsteds, yarns, pieces, cassimeres, kerseys and dress goods. Not at present employed. Can take position immediately.

1505 **Boss Dyer** on all classes of wool, woolen and worsted yarns, cotton warps, indigo, etc. Desires to change to better himself.

1476 **Boss Dyer.** Experience on kerseys, broadcloths, dress goods, cassimeres and worsted piece dyes. Has been in good mills for 3, 5 and 7 years and gave satisfaction. Would start in New England or Central States for $3.00 a day.

1355 **Wool and worsted Dyer,** a young man with 5 years' training by one the best dyers at one of the largest mills in N. E. Experience on worsted and woolen cheviots, clays, worsteds, suitings, cloakings, beavers, dress goods, carriage cloths, yarn, slubbing, wool. Now boss dyer. Good reasons for desiring a change.

1559 **Boss Dyer,** raw stock, cotton, woolen and worsted yarns and piece dyes. A Scotchman with very thorough training. 13 years in this country. Now employed but will change for good job paying over $3.00. Age 37.

1561 **Boss Dyer,** with long experience on all kinds of worsted, serges cloakings, flannels, repellants, kerseys, also all wool, cotton and silk. Best of references. Age 35; married.

DESIGNERS.

1586 **A Young Designer** with training in a German Textile School and Norwegian Woolen Mills, has recently arrived in this country and would like to connect himself with the designing department of some first class mill. At present temporarily employed and can give American references. A bright, young Norwegian, who will doubtless develop into a first-class designer.

1577 **Assistant Supt. or Designer.** Has had experience as designer on beavers, kerseys, cassimeres, cheviots and wool, worsted and cotton novelty dress goods. A graduate of Philadelphia Textile school. Has had practical mill experience as loom fixer on Knowles & Crompton looms, dresser and beamer, also in office work, book-keeping, calculations, etc. He is at present employed. Age 25, single.

1474 **Designer of Woolens or Worsteds.** Has had textile school training, and about four years in good mills on novelty dress goods, cassimeres, blankets, coverts, etc. Very well recommended. Can accept position at once as designer or assistant superintendent.

1449 **Overseer of Weaving or Designer.** Age 38; married; American. Thoroughly capable. Has designed his own goods for eight years, and studied designing for two years. Left last position on account of sickness, and will take a small salary to start. Has worked on all classes of cottons, plain and fancy, and is acquainted with all makes of machinery. Refers to former employers and others.

1509 **Designer, or Boss Dresser,** or will take superintendency of small mill. Age 38; married. Has worked on dress goods, fancy worsteds, cloakings and piece dyes. At present employed as boss carder, but desires to better himself, if possible.

FINISHERS.

1526 **Foreman of Finishing Room,** Folding, Packing, etc. Age 45; married; English. Has worked on white and colored goods and prints. Is acquainted with every kind of machinery used in his business. Has worked 11 years in this country. Can give good references.

1534 **Overseer or Second-hand** Woolen Finishing. Age 26, unmarried. Has worked on fancy and piece dyes, broad-cloths, coverts, cassimeres, etc At present employed, but wishes to better himself. Good references.

1494 **Finisher on Felts,** or will take a position for the making of sizing. Age 26; single. His last position was engineer and in charge of sizing and finishing all classes of felts. Good references.

1489 **Boss Finisher. Second-Hand** or Boss Shearer. Well experienced; excellent references. English; age 27; single.

1396 **Wool Finisher.** This man has had a very large experience among well-known mills and refers to past employers. Character and ability of the first order.

1351 **Woolen and Worsted Finisher** with 7 years' experience as overseer in R. I. and N. Y. mills, from which he has excellent references. At present second hand in one of the best worsted mills in N. E. Habits first-class; age 29, married

1379 **Overseer, Cloth Room.** Out of work because of change in management. A man with first-class record and wide experience. Refers to several prominent mill men. Age 39; married, American.

MISCELLANEOUS.

1571 **Woolen Salesman,** who has filled successfully all positions in woolen jobbing house, desires a position with manufacturer or dealer in textile goods. Fine business qualifications and A 1 references.

1418 **Cloth Hall.** Overseer, shipping clerk or paymaster. Has had a thorough experience in each of the above positions and is familiar with white and colored cotton goods. Is well recommended. Aged 35. Married, and is also a good all around accountant.

1488 **Boss Carpenter or Master Mechanic.** Age 46; American. Is acquainted with all makes of cotton machinery, and is a good man on shafting, wood work, etc. At present employed, but wishes to better himself.

1557 **Bleacher,** overseer or second hand. Well recommended, good training, reliable. Wants $2.50. Age 27; married.

1558 **Supt. of Bleaching,** dyeing and finishing, of all classes of cotton piece goods, plain and figured, desires a position. Has had over 20 years' experience in managing help, and has a thorough knowledge of the business in all its branhes es. Can furnish excellent references from present and past employers.

1555 **Silk Superintendent.** Experience in all departments of a large and successful mill; serges, sateens, linings. Young man but well qualified to take charge or to act as assistant superintendent. Knowledge of office work and prices as well as machinery.

1552 **Overseer Beaming & Slashing,** at present employed but would like to change for good boss job. First class experience and good references, age 32.

1560 **Overseer Twisting and Reel** ing who has worked 20 years in the same mill, 10 years as overseer, has resigned on account of new supt. Refers to proprietors and former supt. Age 38, married. Experience on threads and twines.

1583 **Overseer of Cloth Room.** A young American, married, would like a position as office assistant, shipping clerk or in cloth room. Has had about six years' experience in Connecticut cotton mills. Will start at moderate wages if there is prospect of future advancement.

1520 **Overseer on Prints, Sheetings** and Shirtings. Age 32; married. Wishes to obtain a position in the New England States.

1579 **Supt. of Bread Silk Plant.** A man of executive abilities and with long and thorough experience in the designing and manufacture of all classes of silk goods. A1 references.

SUPT. WITH CAPITAL.

Experienced young man with some capital wishes to invest same with services or services alone, as superintendent of small woolen or worsted mill or assistant superintendent of large plant. Best of references. Address, H. C., care of Texile World.

THE INVINCIBLE

FULL AUTOMATIC KNITTING MACHINE

IS ADAPTED TO THE ECONOMICAL PRODUCTION OF ALL CLASSES OF SEAMLESS HOSIERY.

• • •

It is the only full automatic machine made to be fastened to a bench, occupying no more space than semi-automatic machines.

• • •

• • •

It has a simple and positive attachment for putting in and taking out an extra thread in heel and toe automatically.

• • •

A simple and positive attachment can be applied for **making high spliced heels and double soles automatically**, at the same time the heel and toe are reinforced by an extra thread. The splicing arrangement is supplied with yarn from a bobbin holding a quantity of yarn, and not from a small cop such as is usually used in devices of this kind.

The only successful yarn changer is applied to this machine. This device changes the yarn automatically at heel and toe, or at any desired point in the knitting of the stocking. It does not require a revolving bobbin which is commonly used in similar devices, but allows the use of a full size winder bobbin or cone for each yarn used. It is perfectly positive in its operation, is simple and well built, and is recommended as filling a popular demand.

In knitting "string work," **a loose course** is put in as a guide for cutting off each stocking. **A loose course can be be put in for looping** the toes. This is a great advantage in fine gauges.

Attention is invited to the new method of transferring tops to the needles of machine in knitting Half Hose, and in footing ribbed leg hose.

The method of doing this is entirely new, and must not be confounded with the ordinary method of transferring with a quill ring.

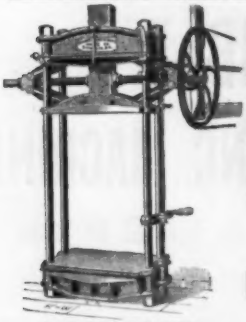
The speed of the machine is reduced just before changing from circular to reciprocatory knitting, thus avoiding all shock. All parts are interchangeable.

By changing cylinders only, the machine will make either fine or coarse gauge of goods.

The Invincible is a compact, light running, full automatic machine, simple in construction, has few parts, runs at high speed, occupies small space, and is put upon the market at a price that defies competition from either full or semi-automatic machines.

E. JENCKES M'F'G. CO.

It may be seen in operation either at our **Factory, at Pawtucket, R. I., U. S. A.** or at our branch office, ROOM 370, BOURSE BUILDING, PHILADELPHIA, PA., U. S. A. Correspondence invited. Location at National Exposition, EX. P-7—H.



KNUCKLE JOINT.

BOOMER & BOSCHERT

BALING PRESSES

ARE THE STANDARD.

Boomer & Boschert Press Co.

338 West Water St., SYRACUSE, N. Y.

HYDRAULIC.

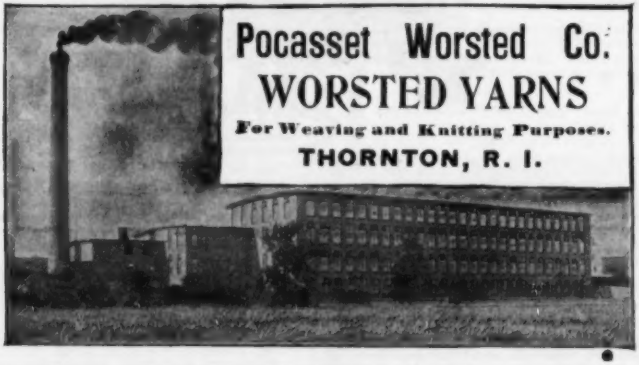
EASTON AND BURNHAM MACHINE CO.,

Pawtucket, R.I.

ALL KINDS OF Spindles USED IN THE MANUFACTURE OF COTTON, WOOL & SILK

IMPROVED UPRIGHT SPOOLERS

TO SPOOL FROM COP, SKEIN, OR BOBBIN.



Pocasset Worsted Co.

WORSTED YARNS

For Weaving and Knitting Purposes.

THORNTON, R. I.

Knitting and Weaving Yarns

Cones, Cops, Warps, Skeins,
Single, Double, Three-ply, etc.
Peeler, Egyptian, Mixed Colors.
Large Assortment.

EDWARD S. HYDE, 223 and 225 Chestnut Street, Philadelphia, Pa.

YARN DEPARTMENT.

Eastern Yarn Market.

Cotton Yarns: Northern spinners refuse to accept new contracts only on advanced prices. Mills are well sold ahead, especially on combed yarns.

Coarse combed Peelers and Egyptian are very scarce and hard to obtain; prices very firm and likely to advance again.

Carded hosiery. Prices were advanced last month ½c per lb. and Egyptians 1c per lb.

Southern yarn spinners met last week, and decided to advance price on single hosiery yarns from 1c to 2c per lb. On two ply, 1½ to 2c per lb. All new orders or contracts taken only at advanced prices. They claim to have a very strong organization which will control their prices on all future business.

Worsted Yarn: Spinners are well employed with more orders than can be well attended—some are only accepting in limited quantities for immediate deliveries, while the larger spinners are accepting orders for February-March delivery, and have booked large orders on these lines. Prices on ¼ blood cheviot yarn in 2/14s to 2/32s have advanced 8 to 9 cents per pound within the last year, selling today at 57 to 60 cents against 47 to 50 cents of one year ago.

The going yarns today are made from Territory wool, as buyers are not in position to pay for cloth out of Australian at the high prevailing prices. Yarns made from Territory wool within the last three or four weeks have advanced 10 cents per pound, and many believe that within the next 60 days a further marked advance with be witnessed. 2/40s ½ blood has been selling recently for 91 cents per pound; at time of writing the price is 96 cents per pound; 2/50s same grade $1.05 per pound, now $1.10 per pound. Spinners are offering Lincolnshire lustre yarn at very low prices, but there is no demand at present for this yarn except for braid yarns in limited quantities. The Astrachan trade using this class of yarn is completely gone and prices that these yarns can be sold for cut no figure.

This has been a fancy worsted season and on a medium grade of wool. The next heavy-weight season is to be one in which fine Australian yarn will largely be used—such as was used previous to 1893 or before the demand for cheviots started. When the demand does come for cloth and yarn made from this stock, spinners will be forced to pay a pretty stiff price for the wool, and weavers who have been carrying this class of yarn for two or three years will have a chance to work it up. Many weavers of this fine cloth ordered many thousand pounds in anticipation of the advance, and as yet have had no chance to use it up. When however, the spinners do take orders for this yarn the prices will probably range at $1.15 for 2/40s and $1.25 to $1.30 for 2/50s.

The Philadelphia spinners have led the advance this season and are accepting orders cautiously.

The weaving mills are sold way out of sight and weavers cannot accept more orders. Most of the mills at this writing are still making heavy weights, and will be for two or three weeks longer, when they will be forced to start light weight in order to fill orders already taken and have seasons properly balanced. There is a great shortage of heavy weight cloth, and buyers are questioning styles if they can get the goods. Clothiers are sending duplicate orders and are begging for deliveries. Some weavers are working carpet yarn into goods in or-

(Continued on page 149)

Frank E. Patterson, Prest. Oscar W. Wood, Treas

GERMANTOWN SPINNING COMPANY INCORPORATED GERMANTOWN JAN. 9TH 1890

Germantown Spinning Co.

COTTON CARDED

HOSIERY YARNS

In numbers from 6s to 26s.

Germantown, Philadelphia.

W. Warren Thread Works,

SPOOL COTTON

on 100 to 12,000 yd. Spools or Tubes.

A Specialty of Thread for Manufacturers Use

on Spools, Tubes or Bobbins.

Also Seaming and Hosiery Yarns

on Cones, Tubes or Skein.

Our bleaching and dyeing facilities are new and unsurpassed for prompt and neat work. Correspondence solicited.

WESTFIELD, MASS.

The Best is the Cheapest.

It is BETTER and CHEAPER to wind yarn by the "Universal" system before shipment from the mill, thus insuring perfect delivery to knitting machines without rewinding.

UNIVERSAL WINDING CO.,

F. H. BISHOP, Manager.

226 Devonshire St., - Boston, Mass.

(Continued from page 22.)

der to meet certain prices, and dress goods manufacturers are making certain lines of dress goods out of this class of stock. The dress goods manufacturers are generally busy and are using much 2/36s from ¾ to ½ blood. Top manufacturers are very busy.

The American Woolen Co. are adding 1000 more looms to their plants and are buying large quantities of outside yarn, mostly in 2/40s, fine quality. Spinners of French system yarn are well employed, with good orders booked. Prices continue to steadily advance and knitters who have been out of the market for a long time because of purchases made anticipating advances, are now buying yarn and are paying advanced prices.

Manufacturers of worsted underwear, the first of the season, refused to accept orders without getting fair prices in return. Buyers thereupon placed only small orders and the duplicates have been much larger than original orders at steadily advancing prices.

Woolen Yarn: Spinners of woolen yarn are generally busy with more orders than they can well handle. As has been pointed out by these articles in times past, the amount of woolen spinning machinery in this country is not sufficient in good times to take care of requirements when woolen yarn is demanded; added to this the fact many of the spinners doing business in times past are now out of business, and as a result shortly we shall have a greater demand than can be handled by spinners now in existence. The heavy weight season still holds out, requiring backing yarn and other yarn necessary for heavy weights, thus employing much machinery which otherwise at this time of year would be idle. Again, knitters are having larger reorders than has ever been the case since the hard times set in.

These mills are buying quite freely, with the prospect of further ordering as the season advances. Some of the knitters with machinery enough in or-

(Continued on page 151.)

CATLIN & CO.,
YARNS.
67 Chauncy St., Boston
316 Church St., New York.
306 Chestnut St., Philadelphia.

Walcott & Campbell Spinning Co,
IROQUOIS MILLS.
FANCY HOSIERY YARNS
IN ALL COLORS.
New York Mills, Oneida Co., N. Y.

JAMES E. MITCHELL & CO.,
Commission Merchants.
122 & 124 Chestnut St., Philadelpia, Pa.
74-78 Summer St., Boston.
Cotton, Woolen & Worsted Yarns.
All numbers on Hand and Made to Order.

Cohannet Mills,
TAUNTON, MASS.
Spinners of High Grade
HOSIERY YARNS OF EVERY DESCRIPTION.
Selling Agents JAMES E. MITCHELL & CO, Philadelphia and Boston.

TUCKER & COOK MFG. CO
MANUFACTURERS OF
WHITE AND COLORED COTTON **WARPS**
Nos. 6s to 30s,
On Beams, Jack Spools or in Chain
CONWAY, MASS.

GRANT YARN CO.,
COMBED AND CARDED COTTON
YARNS 40s and above. AND
FITCHBURG, MASS. **WARPS**

E. JENCKES MFG. CO.
Colored Cotton, Hosiery, Woolen and Merino **YARNS**
PAWTUCKET, R. I.

LINEN YARN IMPORTER.
Hughes Fawcett, 115 Franklin St., New York,
Flax, Hemp & Jute Line and Tow Yarns,
FOR WEAVING PURPOSES
Linen Jacquard Harness Twines.
Fine Cotton Harness and Heddle Twines.
For Cotton, Silk, Woolen and Carpet manufacturers. Correspondence solicited. Samples promptly furnished.

CAPACITY, 50,000 Spindles.

ORSWELL MILLS

FITCHBURG MASS.

COMBED OR CARDED

COTTON YARNS

In Chains and Skeins, on Balls, Beams, Spools—single or twisted.

...CORRESPOND WITH THE...

American Moistening Company, Boston, Mass.,

And learn what their system of air moistening has accomplished. The

"DROSOPHORE" AND "VORTEX" HUMIDIFIERS

Have been most advantageously adopted by the representative mills of this country. Our system will increase your production and overcome troublesome electricity, making your carding run much better. It will reduce your waste account, and generally prove a profitable investment. With our system a perfect **Spinning** or **Weaving** atmosphere in any climate or weather is assured, and any degree of humidity is obtainable. Will cool the air in warm weather, and warm it in cold weather. **Purifies the air and makes it healthier for the work people.** Write for Booklet on Humidification.

AMERICAN MOISTENING COMPANY, 150 Devonshire Street, Boston, Mass.

Cotton Warps.

WHITTIER COTTON MILLS,
LOWELL, MASS.

YARNS

SOLIS : : BOSTON.

179 Devonshire Street.

ANDREW J. SOLIS, Jr. & CO.

INDIAN ORCHARD COMPANY,

Indian Orchard, Mass.

Manufacturers of - - - -

COTTON WARPS AND YARNS

In gray and all colors, single or in any twist.

COLORED COTTON

Machined, Carded or in Roving.

NOVELTY YARNS

In Cotton, Mercirized Cotton, Silk and Worsted, in various Patterns, Colors and Twists.
We are always pleased to assist our patrons of the Woolen Goods manufacture in special pattern warps for samples.
We use a uniform grade of long stapled cotton in all our manufacture.

(Continued from page 149.)

dinary times to take care of requirements are placing orders for outside yarn.

The fancy French flannel yarn continues in good demand with spinners well sold up. The season for knitters of 2-ply dyed yarn has been exceptionally good. Many orders have been placed for this yarn with the prospect that when the next season opens in December the demand will be greater than ever. This will also apply for yarn for woolen men's wear. There can be no doubt that the coming heavy weight season will witness a revival and call for cloth out of woolen yarn, and many of the worsted mills who are without woolen cards will be forced to purchase of outside mills. There is much merino yarn being used for hosiery, and hosiery manufacturers who have been running worsted yarn state that the prices are getting so high for this class of yarn that next season they will be forced on to woolen yarn.

Knitters have about reached the end of their wool piles, and the coming heavy-weight season is one of great moment to them, as at that time an entirely new line of stock must be employed. Thread waste is high on account of the great advance in wool, and the manufacturer who has been using threads at 46 cents per pound must now pay from 57 to 64 cents per pound. It is probable there will be large quantities of carbonized noils imported later, either in Australian or Buenos Ayres grade; the prices will range from 54 to 70 cents per pound, but Australian lambs' to import are worth from 77 to 80 cents per pound. We note, however, that much pulled lambs' and fleece is being sold and is quite low as compared with other sorts. Fine wool tops and slubbings continue in demand. There is but a limited quantity in hand, with prices ranging from 65 to 68 cents and 70 cents per pound. Black natural wool tops continue in good request, with an

(Continued on page 153.)

WOOLEN AND MERINO YARNS. Special line for Bicycle and Golf Goods in all shades
For Hosiery, Gloves, Underwear, and all kinds Knit Goods. Cop, Cone and Skeins.
The J. & H. Clasgens Co.
New Richmond, O.

WE BUY FOR CASH!
ODD LOTS OF
YARNS AND WARPS
ENOS CROSLAND'S SONS,
Haverford Ave. and 69th St., PHILA., PA.

A. HERBST. J. W. JONES.
HERBST & JONES,
KENNEBEC WORSTED MILLS.
Successors to Kershaw Worsted Co.
WORSTED YARN SPINNERS,
21st & Naudain Streets,
PHILADELPHIA.

ALBERT R. ELSASSER,
Clifton Worsted Mills,
WORSTED YARNS.
Lustre Worsted a Specialty.
Mills: Addingham, Del. Co., Pa.

C. MOORE & CO.,
MANUFACTURERS OF
TWINES, THREADS AND YARNS.
Jacquard Harness Twines of all kinds on hand and made to order.
S.W. COR. FIFTH & MARKET STS.,
Philadelphia.

EICHMANN & STERNBERG
530 Broadway cor. Spring St., NEW YORK.
Plain and Gassed Cotton Yarns,
HOSIERY COTTON YARNS,
Mercerized Cotton Yarns. Harness Twines.

RICHARD CAMPION,
Selling Agent for—
Bristol Worsted Mills,
Highland Worsted Mills.
17 Bank Street, Philadelphia, Pa.

WAVERLY WORSTED CO.
SPINNERS OF
WORSTED YARNS
FOR WEAVING AND KNITTING.
Main St. & Green Lane, Manayunk, Philadelphia.

HADLEY
SPOOL COTTON AND FINE YARNS COMPANY
COTTON SPINNERS.
MILLS AT HOLYOKE, MASS.

SPINNERS OF
FINE COTTON YARNS
30s TO 100s.
Gray, Bleached, or Colored. On cop, in skein on spools, cones or tubes.
Fine Cotton Warps, single and two-ply, in chain, etc.
Spool Cotton and Seaming Thread.
95 Milk St., BOSTON.

THE WILLIAM CLARK COMPANY,
WESTERLY, R. I.
Mills equipped with the latest and most improved machinery.
Combed Egyptian from No. 20s to 100s. Combed Sea Island from No. 40s to 200s.
Also 2, 3, 4, 5 ply and 6, 9 and 12 ply cable laid.
Hosiery Yarns on Cops Tubes or in Skeins, Grey, Bleached or Dyed. (Fast Colors.

MONUMENT MILLS,
Manufacturers of
White, Colored, Fancy and Double and Twist,
COTTON WARPS
HOUSATONIC, MASS.
4s to 60s.

GREENE & DANIELS MFG. CO.,
COMBED, CARDED AND GASSED
Yarns, Threads, Twines and Chain Warps,
Colored and Bleached Yarns Furnished in any manner desired by the trade.
PAWTUCKET, R.I.

Established 1849.
CARRIAGE CLOTHS.
LIVERY CLOTHS.
ACCOUNTS SOLICITED.
Broad Cloths, Sackings, Cotton Warps, Whip Cords.
C. Coles Dusenbury & Son,
396 & 398 Broadway, N. Y. City.

HAYES, O. H. & CO.
Representative Lines of Woolens
O. H. HAYES & CO.
Liberal arrangements made with manufacturers or men controlling mills' productions.

(Continued from page 151.)

increasing demand from the fine knitters. The knitters throughout the country are busy. All complain much at the prospect of paying much higher prices for wool, and carded silk is being experimented with and large quantities have been sold.

Lack of water has been forcing many mills to run on short time, even though they have many orders to fill, and customers are kicking at delay in delivery.

Philadelphia Yarn Market.

The trade in cotton yarn, which has been very active the past two or three months, has induced a decidedly bullish feeling amongst spinners, and prices have been very materially advanced the past two or three weeks. Stocks are very low, and it would seem the advance is based on the increased demand.

There has been a notable advance on the finer counts of Southern hosiery yarn and two ply warps and skein.

We quote:—

Warps:—

20/1	12¾ to 13
22/1	13 to 13¼
26/1	13¼
12/2	12½ to 13
14/2	13 to 13½
16/2	14
20/2	14 to 14½
30/2	17
40/2	23 to 23½
24/2	15½ to 6
26/2	16 to 16½

Skein:—

20/1 soft	12¾ to 13
19/1 "	12½ to 13
26s	13 to 13½
4s to 10s soft	11 to 11¼
14/1	11½ to 12
16s	12 to 12¼
12/2	11½ to 12
14/2	12
20/2	13¼
30/2	16½
40/2	22 to 23
8/3 hard	10½ to 10¾
16/3 slack	12
16/4 slack	12
16/2 slack	12
12/3 slack	11½
9/4 slack	11 to 11½

FRENCH AND BRADFORD SYSTEMS

B. F. BOYER & CO.,

WORSTED YARNS

IN WHITE AND MIXES.

Woolen and Merino Yarns

OFFICE AND MILL
Delaware and Cooper Sts.
Camden. N. J.

Eddy & Street,
COTTON, YARNS WORSTED,
WOOLEN, AND SPUN SILK.
BRAIDS
PROVIDENCE, R. I.

ED. C. CORNELIS, F. CHAILLY, JOHN J. DOWLING

Cornelis, Chailly & Co.,

The Tussah Silk
BLEACHING CO.

339 East 107th St.,
NEW YORK.

Southern Cones (various qualities):—

6s to 8s	11½ to 12
10s	12 to 12½
12s	12½ to 13
14s	13 to 13½
16s	14
20s	14½ to 15
22s	15½
24s	16
26s	16 to 16½
30s	17

Shuttle Cops:—

6s to 8s	12
10s	12 to 12½
12s	12½ to 12¾
16s	13 to 13½
26s	13 to 13½
40s	17½ to 18½

Mixed Colored Cones:—

6s to 8s	13
10s	13 to 13½

HOWLAND CROFT, SONS & CO.

LINDEN WORSTED MILLS.

Fine Worsted Yarns

OFFICE AND MILLS:

Broadway and Jefferson Ave, Camden, N. J.

Repre-ented by FIRTH BROADHEAD,
937 Bullitt Building, Providence, R. I.

ALLEGHENY WORSTED MILLS,

Thomas Wolstenholme, Sons & Co., MANFRS. OF

Worsted YARNS,

ALL NUMBERS SINGLE AND TWO-PLY,

Sell Direct,

on Cop or in Skein, for Weaving and Knitting Purposes, in White, Natural & Fancy Mixes

Office and Mills: Frankford Ave and Westmoreland St., Phila., Pa.

CRANSTON WORSTED MILLS.

Worsted and Mohair Yarns—white or colors, in skeins, on spools, cones, or shuttle bobbins.

NOVELTY YARNS—of Mohair and Worsted. We are the only manufacturers in the United States making these yarns from the raw material to finished product and making Yarns **only.**

CENAPPED YARNS of all kinds. Doup Yarns. Harness Yarns. For Braids, etc.

...Dyers of Yarn and Slubbing...

BRISTOL, R. I.

George Campbell & Co.

Worsted Spinners.

Yarns, both French System and Bradford.

Knitting Yarns in all Grades and Mixes.
All Numbers to 60s.

21ST STREET AND WASHINGTON AVENUE, PHILADELPHIA.

MALCOLM MILLS CO.,

MANUFACTURERS OF

Novelty Yarns, Silk Noil Yarns, in Fast Colors AND White.

Mills, Frankford, Pa. Office, 229 CHESTNUT ST., PHILA.

(Continued from page 153.)

12s	13½ to 14
14s	14 to 14½
16s	15 to 15½

Eastern Cops:—

10s hosiery	13
14s "	14
16s "	14½
20s "	15½
10s shuttle	13 to 13½
14s "	14 to 14½

Eastern skein ½c. above cops.

Eastern cones ¾c. to 1½c. above cops.

Universal cones ½c. extra.

Egyptian, carded, 5 to 6c. above white.

Combed yarn 5 to 6c. above carded.

The demand for wool spun yarn is active. Prices advanced and spinners are busy. Many spinners have been able to get orders on merino and wool yarn that makes them independent of the cotton trade.

We quote:—

20 cut	14 to 14½
12	13½ to 14
16s	14
26s	16 to 16½

Worsted yarns are still in good demand, at the advance. Spinners are very active and orders are offered ahead of the ability of spinners to execute.

SILK NOILS AND SILK NOIL YARNS
IN WHITE AND COLORS.
MOHAIR LOOPS, KNOTS, AND FANCY YARNS FOR DRESS GOODS AND CLOAKINGS.
A. T. SKERRY & CO., 47 LEONARD ST., NEW YORK.

Don't Be Backward!
Place a trial order for the
MEYER'S THREADS and SILKS
And get the BEST!
JOHN C. MEYER & CO.,
87 SUMMER STREET, cor. Kingston, BOSTON.
For sale by leading dealers. Tel. 515 Oxford.

NEW ENGLAND THREAD CO.,
— MANUFACTURERS OF —
SPOOL COTTON IN NUMBERS FROM 8 to 100,
In All Grades and Lengths on Spools and Tubes.
Seaming Yarns on Cones; Polished Threads and Yarns on Bobbins.
DYEING AND BLEACHING of All Kinds of Yarns and Narrow Fabric a Specialty. Best of Spring Water for Bleaching.
PAWTUCKET, R. I.

The J. R. MONTGOMERY CO.,
WINDSOR LOCKS, CONN.
Manufacturers of
Mercerized Cotton Yarns. GIVES THE HIGH SILK-LIKE LUSTRE IN KNIT GOODS AND WOVEN FABRICS
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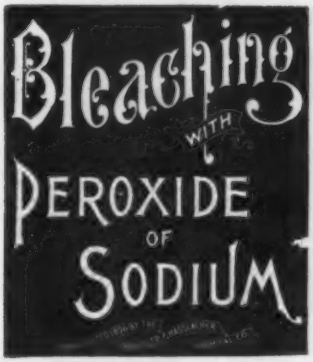

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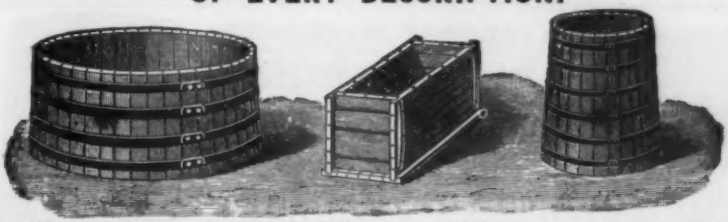

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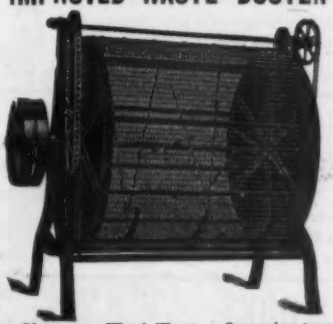

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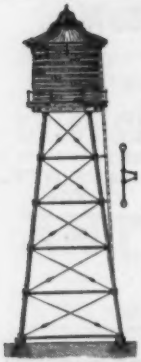

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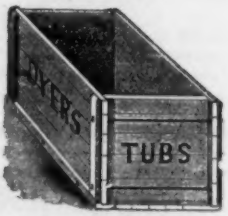

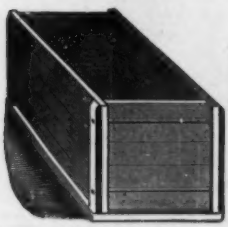

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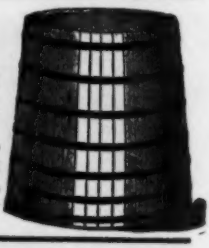

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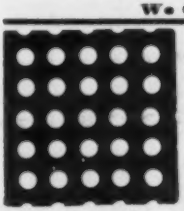

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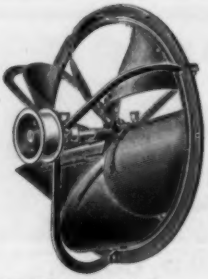

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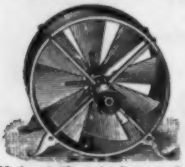

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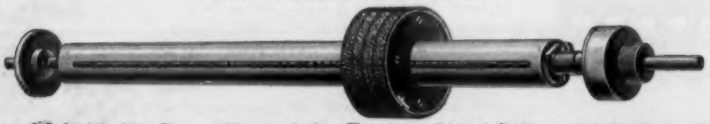

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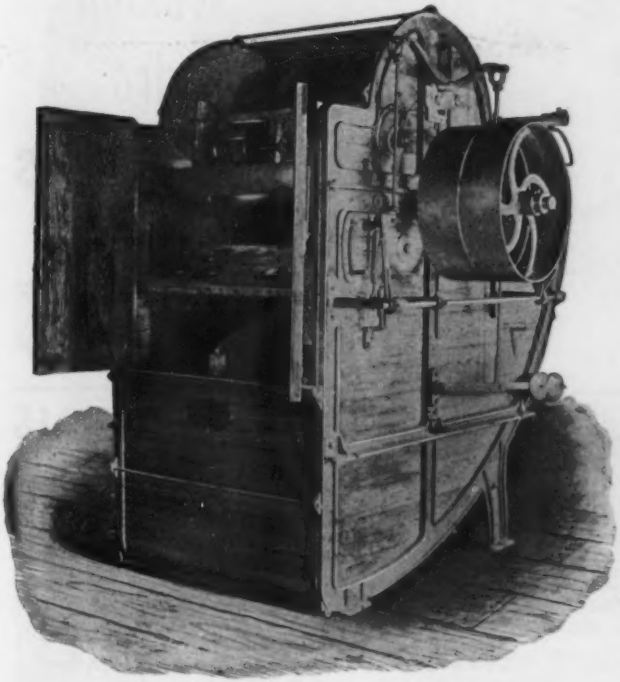

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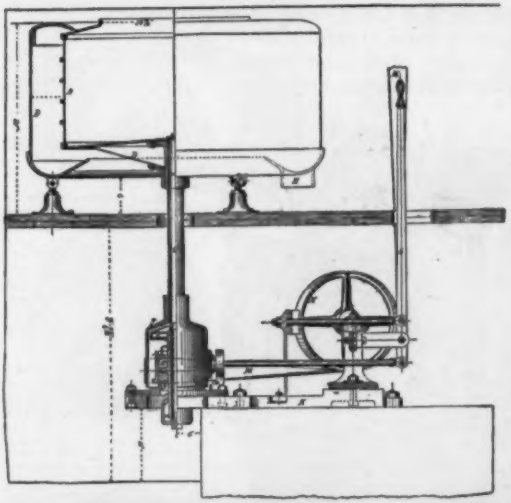

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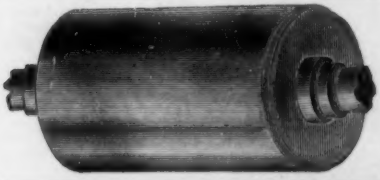

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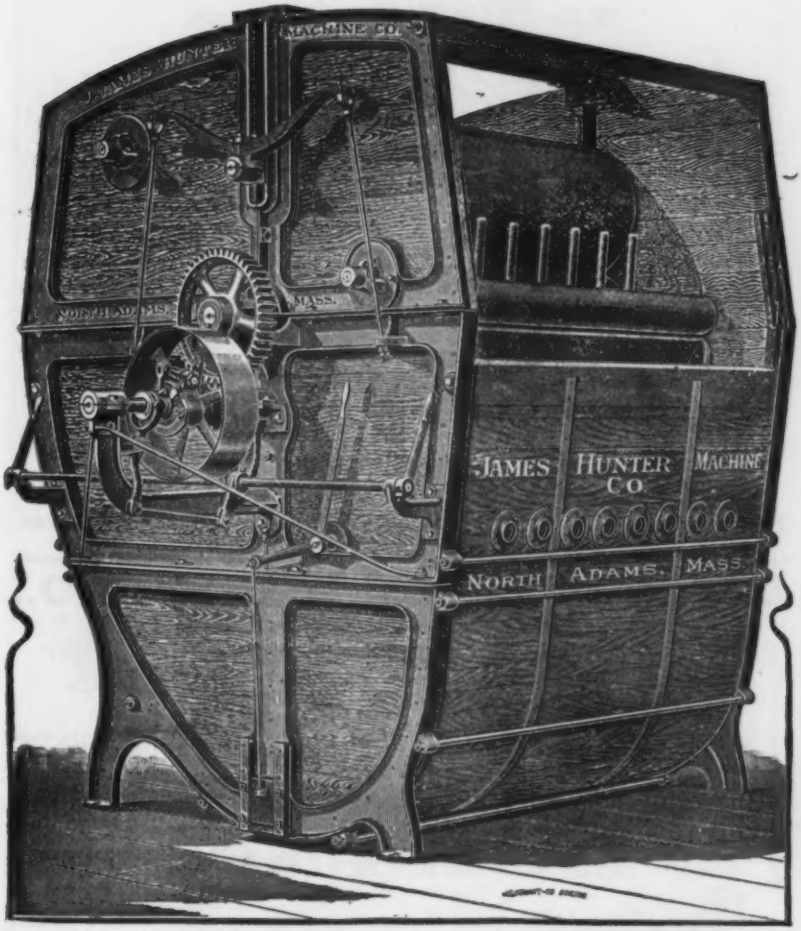

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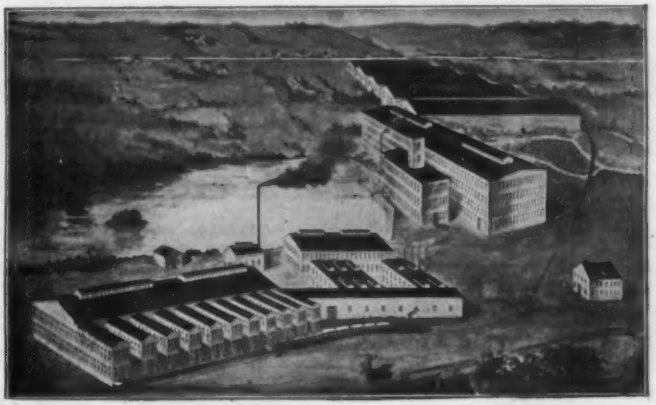

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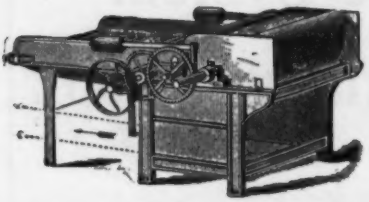

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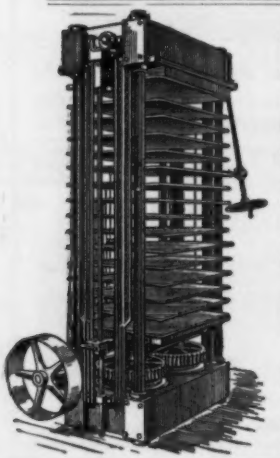

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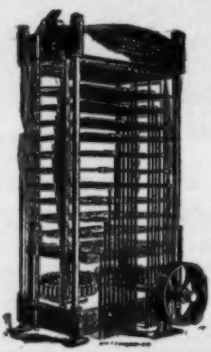

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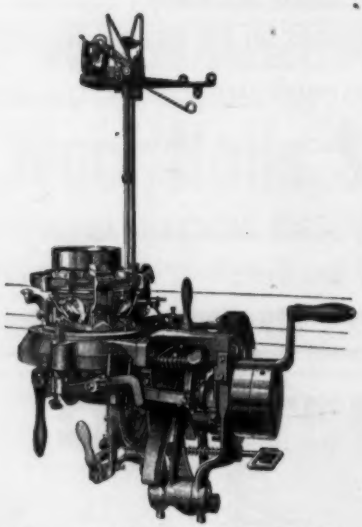

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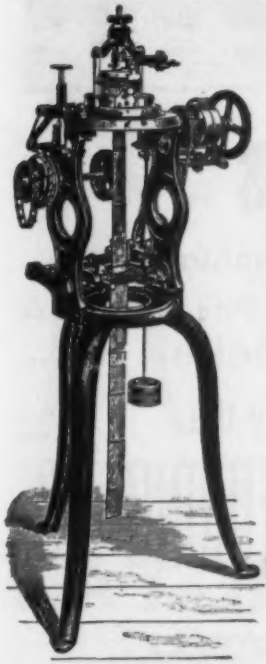

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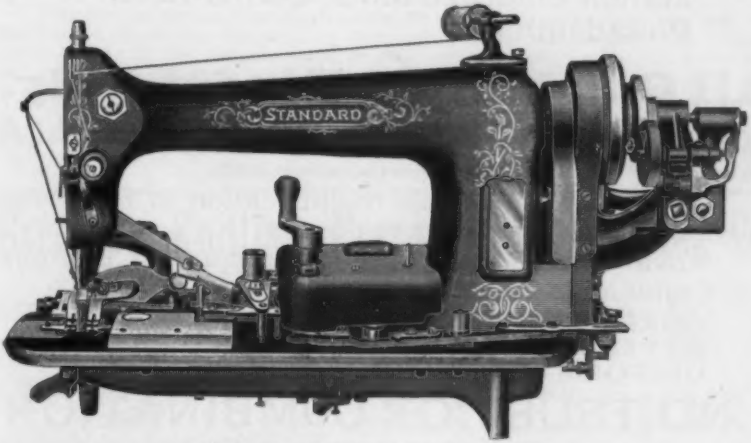

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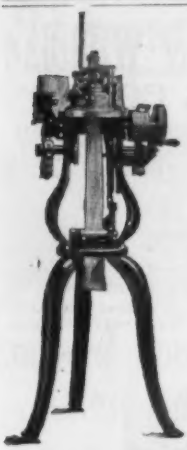

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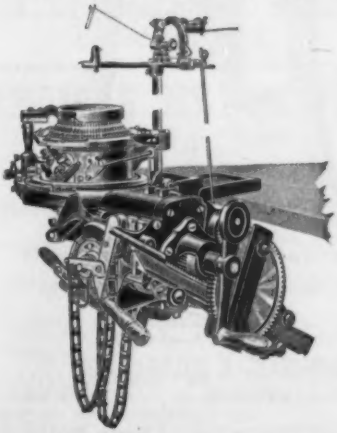

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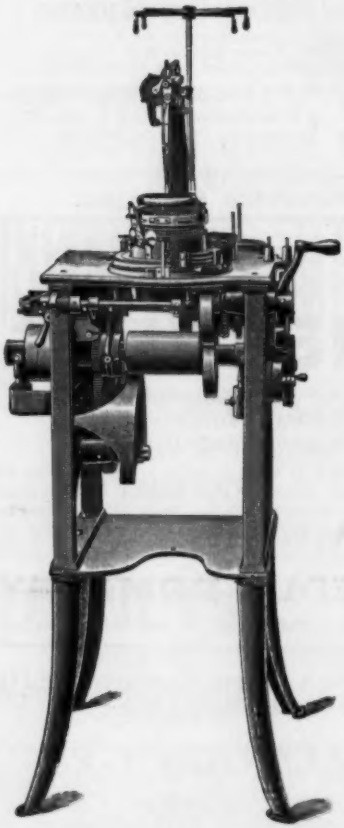

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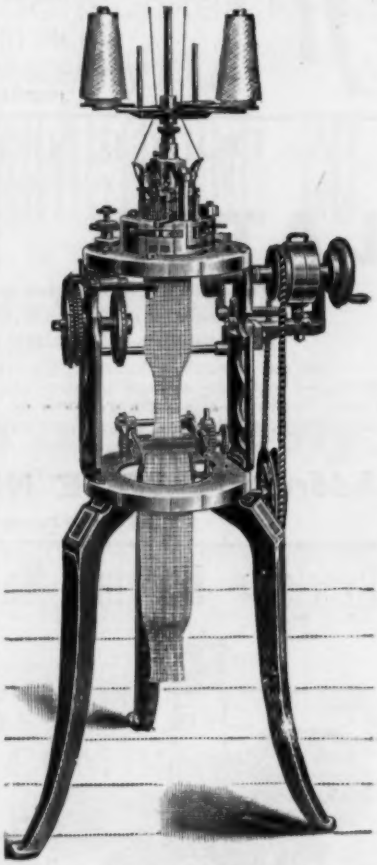

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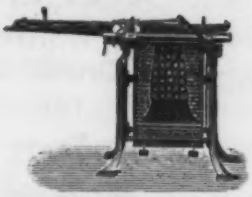

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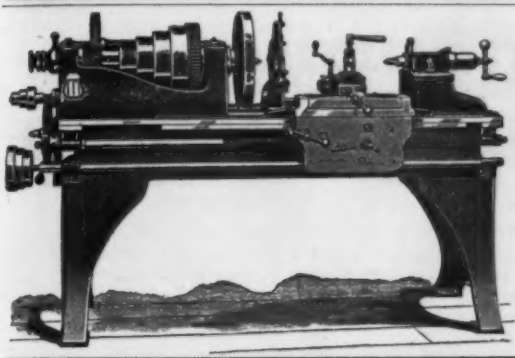

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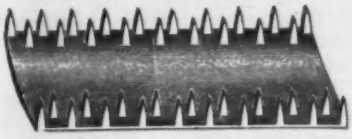

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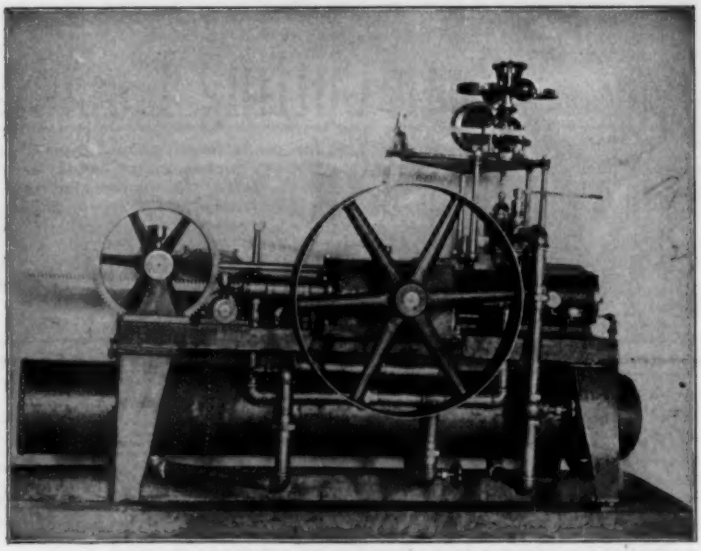

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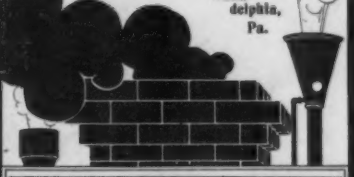

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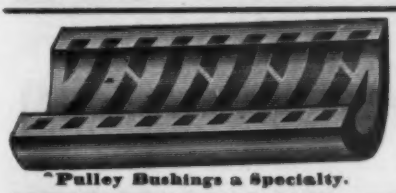

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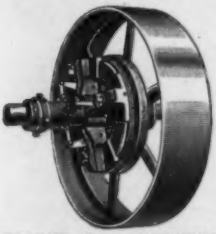

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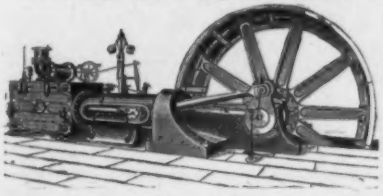

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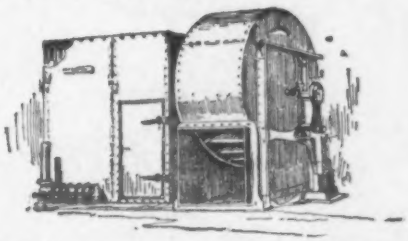

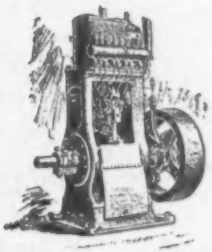

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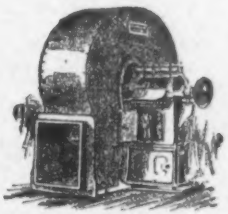

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